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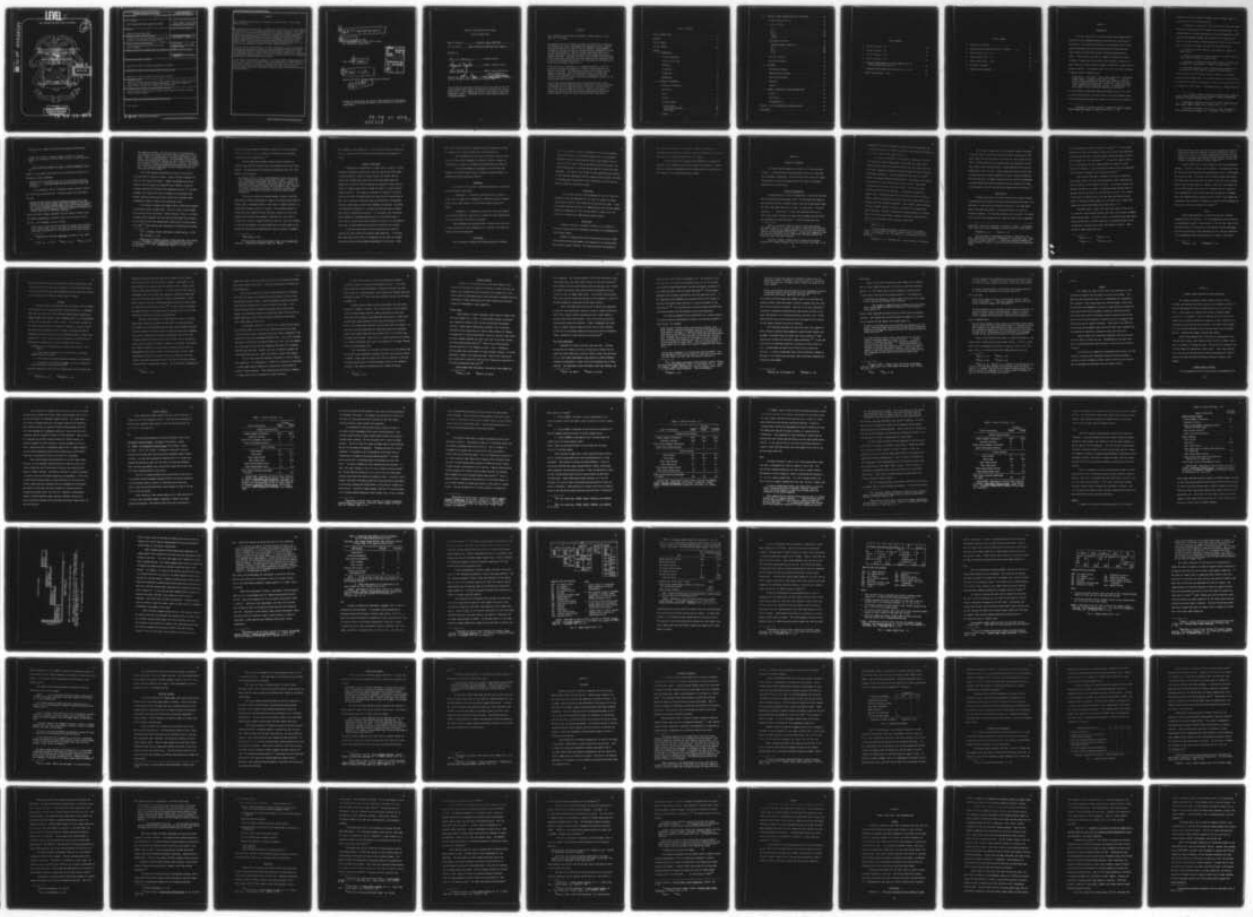

USAF TRAINING FOR NIGHT CLOSE AIR SUPPORT

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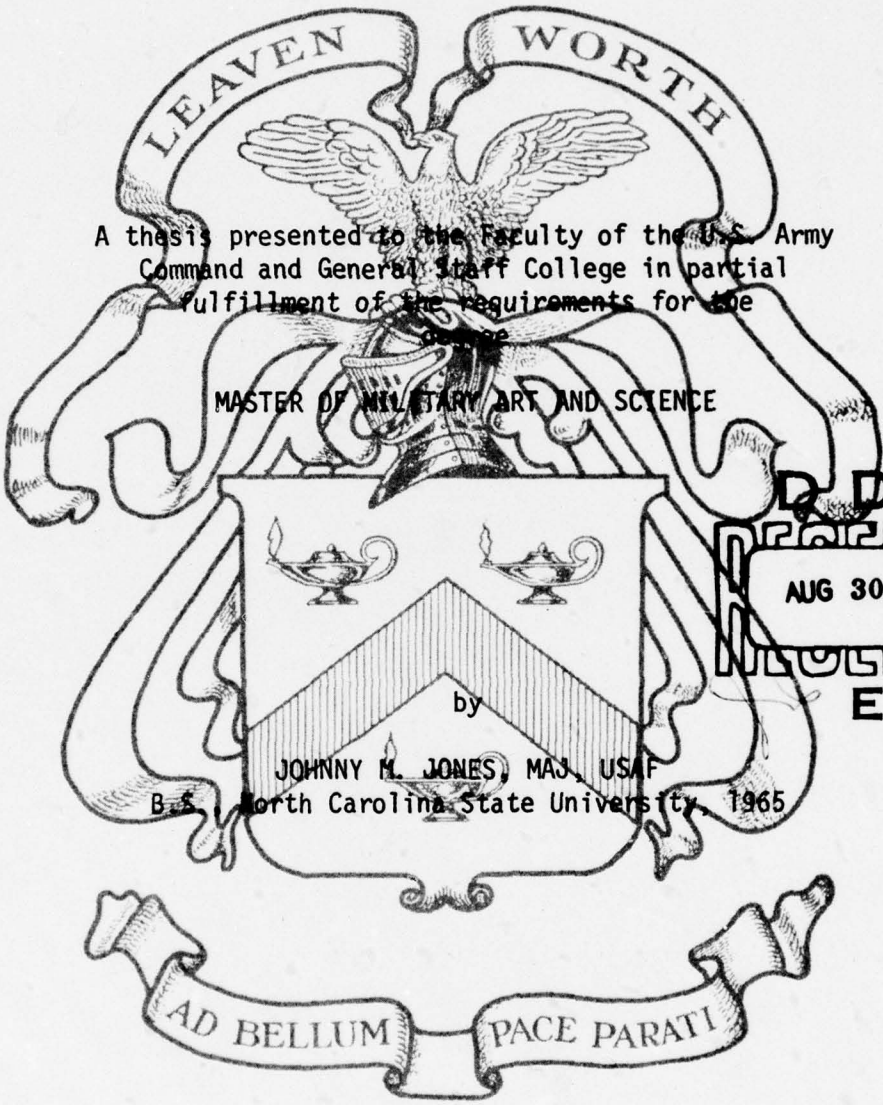

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

JOHNNY M. JONES, MAJ, USAF
B.S., North Carolina State University, 1965

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ABSTRACT

USAF TRAINING FOR NIGHT CLOSE AIR SUPPORT, by Major Johnny M. Jones, USAF, vii + 101 pages.

The capability of the Air Force to support the land battle at night has historically been late in development and inadequate by most standards. This ineffectiveness has resulted from the attempt to use equipment intended for daylight missions by aircrews who were inadequately trained for the night operation. "Can do" aviators improvised tactics and eventually developed relatively successful night attack and close air support techniques. The need for better night equipment and specialized night training was identified after every conflict, but inadequate night training and equipment deficiencies still contribute to the reduction of night close air support capabilities.

If the Air Force is to be part of a credible deterrence, it must be perceived as having the capability to defeat an enemy whenever and wherever confronted. The capability to attack with accuracy at night remains a weak area. While the technology exists to improve that capability, the equipment is not employed in operational tactical aircraft, and tactical fighter pilots are not adequately trained for the night ground attack mission.

In the light of the increasing threat to the North Atlantic Treaty Organization and the night doctrine and capabilities of the Warsaw Pact, a reevaluation of air power priorities is required. Even more important, pilots who are tasked for close air support must be better trained, and their aircraft must be better equipped to destroy enemy armored targets rapidly and effectively during the night attack.

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ABSTRACT

USAF TRAINING FOR NIGHT CLOSE AIR SUPPORT, by Major Johnny M. Jones, USAF, vii + 101 pages.

The capability of the Air Force to support the land battle at night has historically been late in development and inadequate by most standards. This ineffectiveness has resulted from the attempt to use equipment intended for daylight missions by aircrews who were inadequately trained for the night operation. "Can do" aviators improvised tactics and eventually developed relatively successful night attack and close air support techniques. The need for better night equipment and specialized night training was identified after every conflict, but inadequate night training and equipment deficiencies still contribute to the reduction of night close air support capabilities.

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CHAPTER I

INTRODUCTION

Joint U.S. Army and U.S. Air Force studies have emphasized the necessity for the integrated efforts by both services to win the air-land battle. This concept has evolved as the increased cost of equipping and maintaining active Army divisions and Air Force wings has slowly reduced the total force and has dictated integrated battle tactics. These tactics use close air support to augment the organic firepower of ground units and to offset the shortages of surface firepower needed to service increasing numbers of Warsaw Pact targets during ground operations. In the annual report for Fiscal Year 1978, Secretary of Defense Donald H. Rumsfeld said:

> Allied and U. S. war reserve stocks remain below what is considered prudent levels. Firepower ratios favor the PACT. . . . [As the Soviets further improve their capabilities,] NATO [North Atlantic Treaty Organization] deficiencies in artillery, tanks and multiple rocket launchers will become more serious. If uncorrected, force and firepower ratios could become dangerously unfavorable.[1]

This trend toward increasingly unfavorable combat ratios is not likely to change substantially in the near future, and, after computing ammunition consumption and numbers of targets to be serviced, the concept of

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[1] Department of Defense, Donald H. Rumsfeld [Secretary], Annual Defense Department Report, FY 1978 (January 1977), p. 109.

integrating close air support to augment ground firepower appears to continue to be an operational necessity.

The National Security Act of 1947 gave the Air Force the responsibility for providing close air support for the ground forces. This responsibility was further developed by the Key West Agreement of 1948 and the 1970 agreement between the Secretaries of the Army and Air Force.[2] The Joint Chiefs of Staff Publication 2 gives the Air Force, as one of its primary functions, the specific responsibility for:

> a. Providing Air Force forces for close combat air support of ground forces.
>
> b. Conducting individual and unit training of Air Force forces for close combat air support of ground forces.
>
> c. Developing, in coordination with other services, doctrines and procedures for close combat air support of ground forces, ...
>
> d. Developing equipment, tactics, and techniques employed by Air Force forces in close combat air support of ground forces.[3]

The Joint Chiefs of Staff define close air support as "air attacks against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces."[4] Aerospace Doctrine: United States Air

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[2]U.S., Congress, Senate, Committee on Armed Services, Close Air Support, Hearings before the Special Close Air Support Subcommittee, 92d Cong., 1st sess., 1971, pp. 10 & 15.

[3]Department of Defense, Joint Chiefs of Staff, Unified Action Armed Forces (UNAAF) (FOUO), Pub 2 (October 1974), p. 33.

[4]Department of Defense, Joint Chiefs of Staff, Dictionary of Military and Associated Terms, Pub 1 (3 September 1974), p. 68.

Force Basic Doctrine, AFM 1-1 (DRAFT), and United States Air Force Basic Doctrine, AFM 1-1, are in agreement with the definition by the Joint Chiefs of Staff and establish close air support as one of the basic Air Force missions.[5] Accomplishment of this mission becomes increasingly difficult in view of the Warsaw Pact capability.

A study of writings on Soviet night attack doctrine, equipment, and training indicates that the Soviets and other Warsaw Pact nations can and will attack at night. In a recent article, Arthur W. McMaster III states: "A wealth of night vision and sighting equipment, coupled with extensive training and planning, provides the Soviet Army with a very credible night fighting capability."[6] He summarizes his article this way:

> Soviet night fighting is a critical aspect of maintaining the momentum. This is Soviet Doctrine, hard and fast. Equally important, Soviet understandings of how battles are won or lost seem to stress the fact that one side must achieve a critical combat advantage over the opposition by masking his concentration of forces. Writings on the criticality of surprise and the value of night operations all support this philosophy.[7]

The Warsaw Pact countries have improved technology and production of night fighting equipment and stress night training for all of

---

[5]Department of the Air Force, Aerospace Doctrine: United States Air Force Basic Doctrine, AFM 1-1 (DRAFT) (20 May 1977), p. 19.

[6]Arthur W. McMaster III, "Soviet Night Operation," U.S. Army Aviation Digest, January 1976, p. 2. (McMaster is a military intelligence officer in the U.S. Army Reserve. He is a specialist in Soviet areas and an expert in Soviet reconnaissance and surveillance.)

[7]Ibid., p. 17.

their units and missions.[8] In this connection, the U.S. Army Intelligence Center has stated:

> Unlike other "special operations" combat at night is considered normal to Soviet units. . . .
>
> Soviet Doctrine stresses the opportunity for surprise, reduced losses in the attack, easier clearing of minefields, and crossing of obstacles at night. . . .[9]

Other writings on Soviet doctrine stress night attacks as a means of surprise, natural cover, and enemy confusion. Analysis of these writings indicates that the U.S. Air Force must be trained and equipped to conduct the close air support mission at night if the Army and Air Force integrated air-land battle concept is to work.

The Air-Land Battle

The basic concepts of Army doctrine are set forth in Operations, FM 100-5. This manual, the capstone of the Army's system of field manuals, sets the stage with the following passages:

> The first battle of our next war could well be its last battle: belligerents could be quickly exhausted, and international pressures to stop fighting could bring about an early cessation of hostilities. The United States could find itself in a short, intense war--the outcome of which may be dictated by the results of initial combat. This circumstance is unprecedented: we are an Army historically unprepared for its first battle. We are accustomed to victory wrought with the weight of materiel and population brought to bear after the onset of hostilities. Today the US Army must,

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[8] A. Belokon, "Illuminating Equipment," Soviet Military Review, March 1977, p. 29.

[9] U.S. Army Intelligence Center, Handbook on Soviet Ground Forces (Fort Huachuca, Ariz., August 1976), p. 1-1.

> above all else, prepare to win the first battle of the next war. . . .[10]

> Because the lethality of modern weapons continues to increase sharply, we can expect very high losses to occur in short periods of time. . . .
>
> . . . . . .
>
> The US Army must prepare its units to fight outnumbered, and to win.[11]

Chapter 8 of the manual establishes the air-land battle concept and is introduced by these statements:

> Modern battles are fought and won by air and land forces working together. . . . [T]he Army cannot win the land battle without the Air Force.[12]

To be successful, the air-land battle concept requires individual training and joint exercises. FM 100-5 explains the requirement this way:

> Because the Army and Air Force are separate services which come together on the field of battle under joint commanders, the requirement for an air-ground communications system and an agreed employment concept (followed by joint training in operation procedures and frequent exercises) is absolutely essential.[13]

General William W. Momyer, addressing the 1971 Senate's Special Close Air Support Subcommittee, indicated a lack of joint Army-Air Force training. His statement, in part, follows:

> I would like to point out an area where not enough joint participation is taking place. That is the area of developing new tactics, techniques and procedures for the employment of our newer weapons

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[10] Department of the Army, Operations, FM 100-5 (1 July 1976), p. 1-1.

[11] Ibid., pp. 1-1 & 1-2. [12] Ibid., p. 8-1. [13] Ibid., p. 8-2.

> and supporting systems. This must be done in an exercise/test environment which simulates the higher threat capabilities of the enemy. Modern land combat against a sophisticated enemy is inevitably a joint airground operation. The development of uniservice tactics and doctrine which ignores the fact or the existing capability of another service is a mistake we can ill afford. The services must operate as a coordinated team and trust each other to do their part. This requires a great deal of joint training to build up trust and work out problems.[14]

One of the greatest contributions of the Air Force to the air-land battle is close air support. Again, FM 100-5 expresses the need for this support and states: "[W]hen the engaged Army forces require close air support to accomplish their mission, it must be provided regardless of difficulty and regardless of cost."[15] The Army commander will expect this close air support to be available when needed, especially during the initial attack with the enemy forces outnumbering friendly forces by more than three to one.

The increase in numbers and capabilities of antiaircraft weapons in the Soviet Forces has been great. This is an area in which combat ratios greatly favor the Soviets. General George S. Brown, in a recent statement before Congress, said that both the motorized rifle division and the tank division have doubled their antiaircraft artillery pieces since 1965.[16] Each division now fields about 70 antiaircraft artillery

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[14] U.S., Congress, Senate, Committee on Armed Services, p. 225.

[15] DA, FM 100-5, p. 8-2.

[16] Department of Defense, George S. Brown [Chairman, Joint Chiefs of Staff], "Statement to the Congress on the Defense Posture of the United States for FY 1978," Congressional Record, 27 January 1977, pp. 426 & 431.

pieces and a large number of portable surface-to-air missile systems such as "the SA 4, 6, 7, 8, 9, which are designed to provide better coverage for their ground forces."[17]

The Yom Kippur War provides insight into the intensity of conflict that close air support pilots may encounter during the "First Battle." The excerpt below reinforces the speculation that the "First Battle" will be intense.

> The Israeli pilots, in fact, found themselves facing on Golan the first integrated missile system ever seen in combat. From ground level to more than 70,000 feet, the Syrian armor was covered: by the SAM-6s, SAM-7s, and ZSU-23 antiaircraft guns at low-level, by SAM-3s at low to medium altitude, and with SAM-2s on top. Over the first week, Israel lost 78 aircraft, two-thirds over Golan--and virtually all to SAM-6s and ZSU-23s as they flew ground attack missions.[18]

This array of Soviet air defense weapons, tested in the 1973 Arab-Israeli conflict and massed in support of any Warsaw Pact attack in Europe, poses a formidable threat to the close air support mission in a mid-to-high intensity conflict in Europe. The increased emphasis on Warsaw Pact night capabilities and training, combined with the night capable array of Warsaw Pact weapons, indicates that the threat to aircraft on a close air support mission at night is a very real problem. In view of this problem, plus the probability of a night attack by the Warsaw Pact forces and the necessity for close air support to augment

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[17] DOD, Brown, p. 431.

[18] Insight Team of the London Sunday Times, The Yom Kippur War (New York: Doubleday and Company, 1974), pp. 184-85.

the firepower of the ground units, is the Air Force ready to perform its close air support role during a mid-to-high intensity night attack in Europe?

Purpose of the Study

A combination of experiences in night close air support in South Vietnam and subsequent training for close air support and night attack in United States Air Forces in Europe, Pacific Air Forces, and the Tactical Air Command have caused this writer some doubts about the capabilities of the Air Force to support the concept of using close air support to augment ground force firepower at night in a high intensity European conflict. This study was undertaken to determine if current unit and individual training prepare Air Force pilots to perform one of their basic missions at night and under the conditions of mid-to-high intensity conventional war which may reasonably be expected. The study also undertook to determine if equipment has been developed to enable those pilots to perform that mission. If the concept that winning the battle depends on integrated operations of air and ground forces is valid, the Air Force must be able to perform its part in all battlefield conditions, including operations during low visibility and at night.

It has been shown that the Soviet and Warsaw Pact doctrine supports the night attack and sustained night operations. It has also been shown that the Air Force is responsible for the close air support role and the training and equipment development for that role. Given

these facts and the concept of augmenting ground firepower with close air support, this study researches the following questions:

-- Are individual training and unit training in the Air Force tactical fighter forces adequate for effective close air support of ground forces at night in a European mid-to-high intensity conflict?

-- Has the development of equipment by the Air Force been adequate for effective night close air support of ground forces in a European mid-to-high intensity conflict?

Hypotheses

As a result of this writer's personal observations, the following two hypotheses were drawn:

-- Hypothesis 1: Individual training and unit training in night close air support are inadequate for effective support of ground forces during night combat in a mid-to-high intensity conflict in Europe.

-- Hypothesis 2: Equipment to give the Air Force the capability to provide effective night close air support has been developed but is not now available in the active inventory.

These hypotheses were analyzed after a review of doctrinal and training publications and an examination of literature with respect to current training and equipment.

Limitations

This study does not address the related problems of optimum

force size, control procedures, probability of kill of new weapons, target destruction, or the detailed capabilities of new equipment. Although this writer recognizes the value of such research and its relation to this study, time and resources limited this study to the stated problem areas of training and availability of effective night equipment. The study is also limited to night operations and training in the presently designated close air support tactical fighter aircraft. To encourage the dissemination of this information, the decision was made to produce an unclassified study.

Assumptions

This study was based on the assumption that the Air Force will continue to have the responsibility for close air support of ground forces and will fulfill that responsibility both day and night. It was also assumed that the Tactical Air Command/Training and Doctrine Command concept of integrated Air Force and Army forces in order to win the battle will continue as an operational planning concept.

Methodology

Related literature is reviewed in Chapter II to establish a historical perspective and to determine conclusions and recommendations from related studies.

Chapter III examines the current United States tactical fighter force combat training requirements, with emphasis on the ground attack and close air support training. The training doctrine and methods of

increasing force readiness are reviewed. Chapter IV examines the development and production of equipment that would enhance the Air Force capabilities for conducting night close air support.

In the fifth and final chapter, each hypothesis is analyzed to determine if the findings of this study support or disprove it. Conclusions are drawn and recommendations are offered based on the analysis of the findings in this study and previous studies.

CHAPTER II

REVIEW OF LITERATURE

The night fighting capability of the U.S. Air Force has been cyclical. It was appreciated during periods of war, but it was never fully developed in peacetime. The first part of this review of literature develops a historical perspective for the night air-to-ground capabilities of the Air Force.

Historical Perspective

During World War I, First Lieutenant Muir S. Fairchild flew more than 100 night hours behind enemy lines.[1] He discovered the impact of the airplane's ability to destroy supply trains and troops moving toward the front lines under the cover of night. He later wrote: "With the lessons of . . . [World War I] in mind, the commanders are sure to utilize the cover of darkness to screen their movements and strive for the advantage of a surprise attack."[2] Fairchild predicted a new

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[1] Muir S. Fairchild, "Notes on Type VIII Night Observation" (26 October 1922), p. 5. (MS No. 168.7001-85, USAF Historical Division Archives. Fairchild flew combat missions as a pilot with the French Air Force in the final months of World War I. He was later commander of the Air Force Air University, and in 1948 he was promoted to general and named Air Force Vice Chief of Staff.)

[2] Charles R. Peters, "Night Close Air Support With Tactical Fighters (U)" (student research study, Air University, May 1970), p. 18.

dimension for the use of airpower at night, but he believed that only specialized aircraft and aircrews trained for the night mission would be effective in night aerial combat tactics.[3]

The events of World War I and increasing demands on the small air arm and its parent organization at that time, the Signal Corps, caused President Wilson to transfer aviation from the Signal Corps and to divide it between the Bureau of Aircraft Production and the Division of Military Aeronautics. This constituted the Air Service in 1918.[4] During this changing period after World War I, the young Air Service was searching for its true identity and its real mission. Many people influenced the activities of the Air Service. One man with great influence was Major William Mitchell. He presented a proposal to General John J. Pershing to make the Air Service two distinct forces in Europe. Mitchell proposed one tactical force under ground armies and a separate force for strategic operations. This proposal, which reflected the views of Major General Sir Hugh M. Trenchard, was disapproved by General Pershing. Mitchell, who became a brigadier general in 1918 and Chief of Air Service Army Group (Europe), continued to concentrate his forces for large attacks rather than parcel them out.[5]

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[3]Peters, p. 32.

[4]U.S. Army Combat Developments Command Institute of Special Studies, "A Short History of Close Air Support Issues," Study Directorate No. 3 (Fort Belvoir, Va., July 1968), p. 2 (hereinafter cited as USACDCISS.)

[5]USACDCISS, p. 3. (Trenchard was a strong advocate of strategic

The strategic concept put forth by General Mitchell and others in the Air Service clashed with the Field Service regulations of 1923 which stated that the chief role of aviation was close support of the Army.[6] Internal conflict in the Armed Forces and reduction of the of the military forces after World War I caused expansion of Air Service capabilities to be very slow. Sources agree that night tactical capabilities were almost totally neglected in favor of daytime operations. This occurred even as airpower advocates such as Fairchild recommended an intensified night-training program due to the extremely poor night flying capability that Air Service pilots demonstrated in World War I.[7]

World War II

Although some night flying experimentation to improve aircraft instrumentation and target illumination occurred between World War I and World War II, when hostilities began in World War II in Europe there were little theory and almost no planning available for night air offense or defense.[8] As historian Joe Gray Taylor observed: "It may be said that the United States Army Air Force was almost wholly unprepared

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bombardment, and he also advocated a unified air command. He expressed these views while he was commander of the British Royal Flying Corps.)

[6]USACDCISS, p. 4. [7]Peters, p. 32.

[8]Joe Gray Taylor, "Development of Night Air Operations, 1941-1952," USAF Historical Study No. 92 (Maxwell Air Force Base, Ala.: USAF Historical Division, 1953), p. 1. (Taylor was Assistant Professor of Social Sciences at Francis T. Nicholls Junior College when he wrote this study.)

for night operations when war broke out in Europe."[9] Pilots had some experience in night cross-country flying, but tactical night operations had been neglected and "no American planes had been designed or specifically equipped for night operations."[10] In the early stages of World War II, when American pilots attempted night air attacks to avoid intense air defenses, it was found that aircrews had not been adequately trained and their equipment was unsuited to the task.[11]

Some progress was made in attempts to provide air support by using radar signals for short range navigation in both Europe and the Pacific during the final months of the war. This system, however, was thought of primarily as a means for bombing through overcast skies in daylight and was used only on a limited scale at night. This limited night close air support activity did make some contribution to the morale of the Allied ground troops, but, as Taylor said, "Night close support was almost non-existent during World War II."[12]

When World War II ended, the night attack capabilities of the U.S. Army Air Force had been expanded over those that had been evidenced before the war began. There was, however, the knowledge that many night attacks had failed or had been impossible to undertake because of lack of experience, training, and proper night bombing equipment. Major Charles R. Peters determined that:

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[9]Taylor, p. 4. [10]Taylor, p. 4.

[11]Taylor, p. 4. [12]Taylor, p. 258.

> When World War II ended, virtually the same suggestions concerning night aerial combat were made as at the end of World War I some thirty years earlier: (1) better equipment and training for night flying; (2) creation of aircrews and aircraft specialized for night combat; (3) brighter, more reliable flares for night illumination; (4) more accurate methods for marking targets.[13]

In March 1946, the Air Force reorganized into three designated commands: Strategic, Tactical, and Air Defense. The Department of the Air Force was established when the National Security Act of 1947 became law on 26 July 1947. At the same time, President Truman signed Executive Order 9877, which specified the roles of the services and charged the Air Force with providing air support to the Army. With demobilization in 1948, however, the Tactical Air Command (TAC) was reduced to only a headquarters and was placed under the Continental Air Command. After this demobilization and because most of the Air Force budget was allocated to the Strategic Air Command, air-ground training between the Army and Air Force was affected considerably.[14]

Korea

Limited experimentation in night operations was conducted between World War II and Korea. The 47th Bombardment Group carried out one experimental project in night attack in 1947 and 1948. Many of its conclusions were to be borne out by the subsequent Korean experience, but the one conclusion of most importance to this study was repetition of a recommendation made during World War II, namely, "that night

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[13]Peters, p. 34. [14]USACDCISS, p. 35.

tactical units should fly their training missions at night."[15]

Shortly after the Korean War started, TAC was restored as a major command and established a school for air-ground operations. "TAC and Army Field Forces collaborated to publish a 'Joint Training Directive for Ground Operations,'"[16] but again, as was the case during World War II, the United States entered the Korean War without an effective close air support system.

> Night close support was sadly lacking during the first three months of the Korean War. Some effort was directed toward correcting this deficiency in October and November 1950, though without any marked success.[17]

The inability of the Air Force to provide night direct support was cause for disparaging comments from United Nations troops on the front lines at the time. Taylor's evaluation of the first phase of the Korean War was that "our night operations against enemy troops could not, by the wildest stretch of the imagination, be credited with any success other than harassing the enemy."[18] Low experience and little preparation and training for night operation caused part of this lack of success. After Taylor researched the June through December 1950 history of the 5th Air Force, he recorded that Major James D. Patton said: "The first five or ten missions for night personnel are an almost complete loss as far as effectiveness is concerned."[19]

The introduction of the MPQ-2 radar to direct aircraft close

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[15]Taylor, pp. 190-94. [16]USACDCISS, p. 36.

[17]Taylor, p. 212. [18]Taylor, p. 212. [19]Taylor, p. 219.

support at night was a great equipment improvement in the night close support problem. The only airborne equipment required was a radio. By the time of the Chinese offensive of April and May 1951, night close support had developed to the point that B-26 and B-29 MPQ-2 radar supported bomber attacks had impressive results. During the heaviest attacks, on the night of 20 May 1951, ground controllers reported that night close support attacks alone had killed two regiments and one battalion of enemy troops by actual count.[20]

The Air Force mounted tremendous night close air support attacks in 1951 during the Chinese offensive. Many still believe, however, that they should have been available earlier in the Korean campaign, and still others claim too slow a response by the Air Force. Also, it must be remembered that the night close air support successes in Korea were realized in a sky that was void of enemy fighters and that very little ground fire was directed against close air support missions. It is questionable whether the "night close support on the scale accepted in Korea could be carried out in a full-scale war."[21]

After the Korean War, General Mark W. Clark suggested that specially trained units should be dedicated to night attack missions.[22]

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[20]Taylor, p. 215. (The MPQ-2 radar was an improved version of the SCR-584 radar that was originally designed to direct antiaircraft fire but was also used to direct aircraft in close support bombing.

[21]Taylor, p. 259.

[22]Mark W. Clark, From the Danube to the Yalu (New York: Harper and Brothers, 1954), pp. 91-92.

The Korean experience again confirmed what had been shown before, that intensive specialized training is essential for effective night operations and that specialized night equipment and joint operations training are also required for effective night close air support.

Vietnam

The period after the Korean War saw a continued conflict between the Army and Air Force regarding their roles and missions. In November 1959, the Joint Chiefs of Staff published Unified Action Armed Forces (UNAAF) (FOUO), Publication 2, which attempted again to provide guidance on the roles and missions of both services. This document charged the Air Force to provide close air support to the Army, to conduct unilateral and joint individual and unit training, to develop doctrine in conjunction with other services, and to develop equipment, tactics, and techniques.[23] The Air Force was given the definite responsibility of developing the capability to support the Army on the ground.

> The major issues involving close air support by the end of 1959 . . . [were]:
>
> a. Does current doctrine insure that the Army is provided adequate close air support?
>
> b. Are current air-ground operations procedures satisfactory?
>
> c. Does the Air Force have the proper aircraft to perform its close air support role satisfactorily?[24]

One could argue that issues have not changed much since that time, but

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[23] USACDCISS, p. 45.

[24] USACDCISS, p. 48.

innovation and technology have improved the capabilities of the Air Force to provide the required close air support. Improvements in the period between the Korean War and the Vietnam conflict, however, were directed toward daytime operations. It is not valid to argue that any improvement would also affect night operations, because aircrews must train for this night contingency to insure its effectiveness. After Korea, "tactical aircrews concentrated almost exclusively on day close air support and interdiction training."[25] A lack of night proficiency was again detected in the beginning of the Vietnam conflict, as in the beginning of the three previously mentioned wars.

When the United States air effort began in earnest in Vietnam, enemy supply convoys and troops used the cover of night extensively. The necessity for night interdiction of enemy supply movement and night close air support of friendly troops in contact became rapidly apparent. This writer's experience in Vietnam from September 1967 to May 1968 included both day and night interdiction in North Vietnam and day and night close air support of troops in contact in the South. This writer was trained initially in an operational training course at the F-4 Replacement Training Unit at MacDill Air Force Base, Florida. Night training was limited to instrument flying, one night air refueling mission, and three night range missions for bomb and gunnery training using artificial illumination (flares). This training was inadequate to

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[25]Peters, p. 36.

produce more than a familiarization with some of the problems associated with night bombing under flares. Certainly night combat proficiency was never approached.

While flying from the air base at Danang, Republic of Vietnam, both close air support and interdiction missions were initially interspersed day and night flights. Later the squadron rotated the day and night mission responsibility in cycles of four to six weeks. This offered a better chance to become accustomed to the night mission; however, the continuing problem of insufficient night training prior to combat caused most pilots to be relatively ineffective during their first night combat mission cycle.

The equipment available in the F-4C for a combat mission during this period allowed for day and night interdiction and day and night visual close air support, although accuracy was largely dependent on the expertise of the pilot and Weapon Systems Officer. Many pilots overcame the lack of training and advanced equipment and, after some very dangerous on-the-job training, gave an adequate performance on all expected missions--day and night. However, the lack of advanced equipment for night attack and close air support continued to reduce effectiveness.

The Air Force made one important improvement in tactics during the Vietnam era. The designation of "Night Owl" squadrons to specialize in night combat tactics dramatically improved the effectiveness of pilots in those squadrons. There remained many deficiencies, however, in night training and in equipment for night operation.

The Air Force, anxious to correct equipment deficiencies, initiated a number of studies and development projects. "From these efforts came self-contained airborne illumination systems, low light level television, infrared devices, laser ranging and improved radar and navigation systems."[26] These and other equipment advances are discussed in Chapter IV.

Without question combat tactics and equipment improved during the years of combat in Vietnam. Yet, as after every military conflict involving United States aviation, combat experienced military men, historians, and strategists concluded that deficiencies in night training and night combat equipment limited the effectiveness of the Air Force in the increasingly important role of night close air support. In each case, aircrews designated for specialized night duty eventually gained night combat experience and improved tactics to the point that successes were realized. Night close air support experience was gained in a combat arena where there were little opposition from enemy fighters and only limited ground fire.

The first battle, as outlined in FM 100-5, will not provide time for pilots to gain experience through on-the-job training over a period of months. Night close air support will be very expensive in the loss of pilots and aircraft if the United States relies on that method of training in the face of the Warsaw Pact air defense structure.

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[26]Peters, p. 47.

Previous Studies

Strategists and tacticians have given much thought to the problem of continuing air support of the battle through the night and weather, but research into the training for this capability is rare. Three studies are discussed below to show the scope of problems that are encountered in night training and to further develop the historical trend of no improvement in night capability.

Peters Study

Major Charles R. Peters completed "Night Close Air Support With Tactical Fighters (U)" in 1970. He highlighted problems he believed were identified in both initial aircrew training and continuation training. Peters drew on experience he gained in the F-100 while training for and flying close air support combat missions in Vietnam. He showed that in 1970 the operational training in the TAC F-100 initial training syllabus provided less than 10 per cent of the total sorties for night ground attack training.[27] None of the training sorties required delivery of live ordnance at night. Small, lightweight, training bombs were used instead of actual ordnance; however, live 20-mm ammunition, rockets, and flares were used. None of the training programs specifically called for training with a forward air controller or for joint training with Army units.[28]

Peters showed that continuation training for night combat was

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[27]Peters, p. 84. [28]Peters, pp. 86-87.

also inadequate. He cited the example of the F-100 continuation training program--only four night attack sorties per year were required.[29] Night ordnance delivery qualifications were not required, and a failure to complete semi-annual night attack training requirements did not result in a loss of combat ready status. His aircrew training manual, AFM 51-100, did not require the delivery of live ordnance or the use of airborne forward air controllers during night training.

Peters concluded that pilots of the F-100 were not adequately trained for night operations, especially close air support missions at night, which require greater concentration and a higher degree of accuracy than similar day missions. Both initial and continuation training were found to be deficient. Peters recommended that night close air support missions comprise 25 per cent of total training sorties for air-to-ground squadrons and that more realism (simulating combat conditions at night) should be incorporated.[30]

Army Night Experiment

Adaptation to night flying has never been easy. Problems encountered are reduced visibility, fatigue due to change from the normal day-night sleep cycle, anxiety, safety, morale, and motivation. The U.S. Army Combat Developments Experimentation Command (USACDEC) conducted an experiment in night flying which attacked some of these problems. The experiment, Attack Helicopter Clear Night Defense, was

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[29]Peters, pp. 86-87. [30]Peters, pp. 91-92.

conducted from 5 July 1972 to 15 December 1972. The objective of the experiment was "to establish a performance baseline for low-altitude clear night helicopter operations from which employment techniques for the attack helicopter could be further developed."[31] The experiment depended on well-trained, experienced, and night-qualified pilots. It was found that "[n]o comprehensive program existed for the conduct of low-level helicopter flight training in a night environment for mid-intensity war."[32] This required that a training program be established to provide aviators with the required training and experience.

The training program that was established for a control group of 12 aviators shows an understanding of some of the inherent problems of night flying. For example:

> About 30 hours of formal ground training were presented, after which, specific tasks were developed from daily conferences and "no holds barred" critiques. A consensus approach was used before the group moved to new unknowns; individual checkrides were administered when the group felt it could routinely and consistently perform a task. Aviators were expected to use judgment and moral courage in aborting missions and "breaking the rules" to prevent accidents as would be required in actual combat. Training was conducted four nights weekly for six months, and aviators averaged 87 night flying hours.
>
> . . . . . .
>
> Training was conducted in an inverted day-night environment. The duty day began at 1830 hrs even though a flight might not be scheduled that night; the "noon" meal was served at 2300 hrs, PT

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[31] U.S. Army Combat Developments Experimentation Command, "Attack Helicopter Clear Night Defense, Phase I," *Final Report--Vol. I:* "Executive Summary," USACDEC Experiment 43.7 (Fort Ord, Calif., March 1973), p. 1-4 (hereinafter cited as USACDEC). (DDC Doc AD909246L.)

[32] USACDEC, p. 2-2.

> [physical training] was regularly performed at 0400 and the day ended with "supper" at 0500 hrs. Billeting areas were isolated to insure adequate rest, and administrative support was geared to the night schedule. . . .
>
> . . . . . .
>
> Morale and motivation were developed by special management attention to personal welfare, and the control group was identified as a professional task force, dubbed the "Owl Team."[33]

The aviation training concept the USACDEC used for its experiment was quoted to better inform the reader of specific problems that occur when night flying training is required. The pilot is not only subjected to the physical problems of performing the night mission but also to the mental adjustments of an interrupted personal and family life. Normal administrative tasks on the installation are disrupted, and all personnel who support aviation training are affected.

This 1972 test concluded that the pilots were fully capable of being trained to perform night engagements against ground targets, but equipment limitations would not permit the routine conduct of "tasks required for reliable and consistent combat performance."[34] To gain the proficiency and experience necessary to conduct the night attack mission, a concentrated and specialized flying training program was required. Is similar concentrated night training offered or needed to provide U.S. Air Force pilots the basic night proficiency necessary for conducting night combat?

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[33]USACDEC, pp. 2-2 through 2-4. [34]USACDEC, p. 5-3.

Garza Study

A more recent look at training for the fighter force indicates that the night combat mission may still receive insufficient training emphasis. In 1977, Major Frank D. Garza completed a study entitled "Fighter Force Training for the European Scenario." His purpose was

> to determine the adequacy of current combat training for the fighter force as applied to a European battle scenario.
>
> . . . [He assumed] a sudden and massive Warsaw Pact armor attack under a highly effective SAM/AAA [surface-to-air missile/antiaircraft] umbrella.[35]

Garza's study researches the spectrum of air-to-air and air-to-ground training. The excerpts that follow highlight his emphasis on training and his concern for the fighter force night capability.

> Training is a variable that can be exploited in preparation for the battle. Realistic combat training that includes current threats and emphasizes initiative and innovative tactics can become the decisive combat multiplier.[36]

> As in past history, the one area in continuation training that probably needs more emphasis is night training. . . . [N]ight training is limited, very controlled, and rarely committed in support of army night exercises. . . . [A]dditional emphasis is required on realistic air superiority and CAS [close air support] training in a Soviet night attack scenario. Joint exercises in support of army units at night in a simulated high threat environment could help to highlight deficiencies and improve night tactics.[37]

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[35]Frank D. Garza, "Fighter Force Training for the European Scenario" (MMAS thesis, U.S. Army Command and General Staff College, May 1977), p. 1.

[36]Ibid. [37]Ibid., p. 36.

> Friendly fighters must be prepared to operate at night just as much as during the day. It may be necessary to dedicate fighter squadrons solely to night operations to keep up with the Soviet tempo.[38]

> To improve night operations, the two areas that must be exploited are aircraft night capability and aircrew training.[39]

Garza concluded:

> [T]he current combat training of United States tactical fighter forces is excellent. . . . There are, however, several areas that require additional emphasis and improvement.[40]

> The Soviet emphasis on a continuous 24-hour offensive operation will require extensive fighter night operations. There is a need to develop a central source for night fighter tactics that can be readily expanded and disseminated to dedicated night squadrons.[41]

Garza recommended that:

> Red Flag should become a central source for developing night fighter tactics against the Soviet employment concept. A squadron should be well prepared at its home base with two weeks of night flying and then deployed to Nevada for a Red Flag night scenario for at least a one-week period. New equipment can be evaluated, and employment concepts can be verified and improved for future operations.[42]

Garza's study indicates that there is a possible weakness in the fighter force training for the night attack mission. If the U.S. Army battle plan is developed using close air support as part of its firepower, the U.S. Air Force training and preparation must not be in

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[38] Garza, p. 61. [39] Garza, p. 62.

[40] Garza, p. 64. [41] Garza, p. 65.

[42] Garza, p. 67. (Red Flag is a nickname for an ongoing exercise at Nellis Air Force Base, Nevada, to provide more realistic combat training. A squadron size unit and its support elements deploy for two weeks to operate in a combined air and surface threat environment to exercise unit and joint concepts and tactics.)

question.

Summary

This chapter has taken a brief look at the development of the capability to support the land battle at night using airpower. This capability has historically been late in development and inadequate by most standards. Most sources agree that ineffectiveness results when aircrews that are inadequately trained for night operations attempt the night attack mission with equipment intended for daytime operations. During each major conflict discussed, aviators improvised tactics and used the trial and error method to develop relatively successful night attack and close air support techniques. After each of the conflicts, military men and strategists have called for better night equipment and the training of specifically designated night qualified pilots.

Recent studies have highlighted inadequate training and equipment for night air attack missions. Recommendations have again been made to include additional night training in realistic joint training scenarios.

The Tactical Air Command has acknowledged the necessity for more realistic training and is developing innovative training concepts. Chapters III and IV research current fighter training and the development of equipment for the night close air support mission.

CHAPTER III

CURRENT FIGHTER TRAINING FOR NIGHT OPERATIONS

This chapter researches Fighter Lead-In Training, initial training, and continuation training that are now provided to pilots of aircraft designated for close air support--the F-4, A-7, A-10, and F-111. A new concept for continuation training, Graduated Combat Capability, is introduced. Red Flag training, which the Tactical Air Command uses to enhance continuation training, is then reviewed for its contribution to the overall pilot training. The focus of this chapter is on the training provided to facilitate the night close air support mission. A generalized summary concludes the chapter.

After pilots complete their first year of undergraduate pilot training basic courses, they receive further training in bomber, transport, air defense, or fighter aircraft. The Tactical Air Command is the training command for operational fighter crews. These crews comprise the pilots who will man the aircraft that are designated for close air support, and these are the pilots whose training is traced in this chapter.

Fighter Lead-In Training

In the progression of pilot training after undergraduate pilot

training, the Tactical Air Command (TAC) now makes extensive use of a rapidly developing program called Fighter Lead-In Training. This program is used (1) to further screen pilots designated for the fighter force prior to their training in the more advanced weapons systems and (2) to start specializing the pilot early in his training. Figure 1 puts the lead-in training and the initial and continuation training phases in perspective.

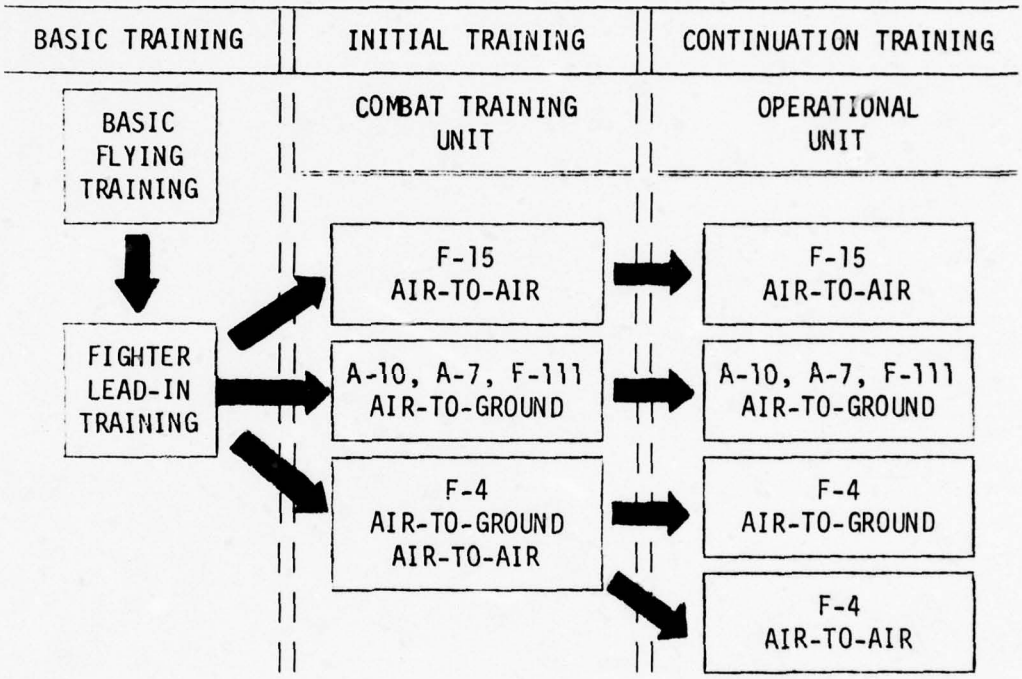

Fig. 1. Phased Pilot Training

Fighter Lead-In Training now begins at the 479th Wing, Holloman Air Force Base, New Mexico. This course is provided to graduates of the Air Force's basic flying school and to pilots who are transitioning from other types of aircraft to the fighter. Fighter Lead-In Training is

flown in the same T-38 twin engine jet trainer that is used in the basic flying course. This allows the student to concentrate on learning tactics and techniques of combat tactical flying in an aircraft with which he is already familiar. The TAC uses the lead-in training to orient pilots who are designated as fighter crews to the requirements and distinct problems of flying fighter aircraft. This course offers an introduction to low level flying, air-to-air attack, and air combat tactics. Forty of the wing's T-38 aircraft have been modified to carry practice bombs and rockets and a 7.62-mm gun.[1]

The T-38 aircraft are used to give initial air-to-ground bomb and gunnery training to pilots en route to air-to-surface designated squadrons. Although some night transition, formation, instrument, and visual night landing training is accomplished, no night ground attack sorties are provided. Formal academic training for night concepts is limited to problems associated with formations, instruments, and landing. No night ground attack concepts or problems are taught as part of the syllabus academic training.

Fighter Lead-In Training is now undergoing revision to provide lead-in training for F-111 pilots. Some sources indicate that reductions in night training are proposed for the course. Fighter Lead-In Training as now conducted offers no basic training toward producing a pilot who is qualified in night ground attack.

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[1] "12th AF To Pioneer F-16 Conversions," Aviation Week & Space Technology, 6 February 1978, p. 117.

Upon completion of Fighter Lead-In Training, pilots go to combat training units to begin the initial combat training phase, the first of two distinct phases of additional combat training. This phase begins with intensive ground training on the weapon system and its operation. After ground training, an intensive flight training program gives the pilot the knowledge for fundamental handling of the aircraft and then progresses rapidly through all phases of flight operation. When a pilot has completed the initial training course for a given aircraft, he should be capable of safely flying all missions assigned to that aircraft. Before the pilot is considered ready to fly in combat, however, he must receive additional qualification training and a certification checkride in the mission of the unit to which he is assigned.

After qualification and certification of mission ready status, the pilot is only minimally qualified and will continue to gain proficiency through the use of continuation training, the second distinct phase of fighter training. Continuation training is normally conducted in 6-month cycles to facilitate scheduling and programming. Pilot time, limited flying training funds, aircraft availability, and the use of bombing ranges and other resources must be programmed and continuously monitored to insure that the pilot receives his required training. Through this 6-month cycle, the pilot will complete a predetermined amount of ground training, study, testing, simulator training, and flying training to maintain his proficiency and mission ready status for the unit missions.

Initial Training

After completing Fighter Lead-In Training, initial training is conducted in the unit equipped aircraft. Pilots who are designated for ground attack squadrons then progress to the TAC training courses for the F-4, A-7, A-10, and F-111.

F-4

The two training courses for initial training in the F-4 are Operational Training Course: F-4 Pilot, TAC Syllabus: Course No. F4000B, and Conversion Training Course, TAC Syllabus: Course No. 4000C. The F-4 "B" course is conducted to provide F-4 mission training for aircrews that have successfully completed Fighter Lead-In Training. Aircrews that successfully complete the F-4 "B" course are awarded the speciality code of an F-4 pilot, but they must complete other training requirements and a qualification checkride at their new unit before assuming mission ready status.

The F-4 "C" course provides mission qualification training for F-4 aircrews (pilots and weapon systems officers) who may be transitioning from another type of aircraft or from recent non-flying duty. Table 1 shows the training provided in the syllabus for each of the two initial training courses.

Night training in both courses begins with a night phase briefing that covers the phase content, regulations, manuals, and night operation procedures. Each mission starts with one or two hours of

TABLE 1.--Initial Training: F-4

Type of Instruction	Syllabus F4000B	Syllabus F4000C
Ground Training (Hours)		
Formal academic instruction	247.5	268.6
Simulator training	65	0.76
Night flying academic instruction	6	6
Night flying phase briefing	2	2
Flying Training		
Total sorties	49	50
Total hours	72.9	71.9
Total night sorties	4	6
Total night hours	7.4	10.2
Night ground attack sorties	3	3
Night ground attack hours	4.3	3.9
Night flying training (percentage of total)	8%	12%

DERIVED FROM: Department of the Air Force, Tactical Air Command, Operational Training Course: F-4 Pilot, TAC Syllabus: Course No. F4000B (Langley Air Force Base, Va., October 1977); and Department of the Air Force, Tactical Air Command, Conversion Training Course, TAC Syllabus: Course No. F4000C (Langley Air Force Base, Va., November 1976).

pre-mission briefing for the purpose of once again stressing procedures, "switchology," and safety. The academic instruction of six hours plus the phase briefing and pre-mission briefings are the total ground training offered on night concepts and procedures.

An examination of the missions flown at night will help in providing a better knowledge of the actual training received. Both syllabus courses provide 3 night ground attack sorties which practice 2 ground attack patterns: 30° and low angle (15° or less) dive bomb patterns. The use of flares to light the target area or ground marking devices for aim points are mandatory. "Ordnance delivery will not be attempted if the target is not illuminated by an airborne flare or identified by a minimum of two ground marking devices."[2] No other munitions delivery is practiced except the dispensing of the flare itself. No tactics problems for night ground attack are explored. In short, the night training in the F-4 initial training courses provides very limited familiarization with just a few of the very complicated problems associated with attacking a target at night. It may be a valid argument that much of the other ground and flying training is applicable and would help increase the effectiveness of the pilots in conducting a night mission. The point is made, however, that the F-4 training course is not oriented toward producing a night fighter, and, in fact, provides

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[2]Department of the Air Force, Tactical Air Command, Conversion Training Course, TAC Syllabus: Course No. F4000C (Langley Air Force Base, Va., November 1976), p. 37.

a very limited familiarization with only a few of the night ground attack problems. The F-4 initial training courses, which still train the largest percentage of the close air support force, are not oriented toward training a night attack pilot. The gaining operational unit is left with providing proficiency in the night mission.

A-7

The second of the close air support designated aircraft to be discussed is the A-7. The accuracy of the A-7 in the ground attack role has proved to be better than that of the F-4. The A-7, however, is programmed to be phased out of the active Air Force and placed in service with the Air National Guard. This will effectively eliminate it as a quick reaction night attack force, because the Air National Guard does not fly night ground attack sorties in either the initial flying training course or continuation flying training. Special Instruction #6 of the syllabus on A-7 flying training states that the "Air National Guard students will not fly ground attack night sorties."[3] The A-7, though limited in numbers and stationed only in the United States, is still tasked to deploy to Europe and function in the close air support mission. The TAC syllabus for A-7 initial training is divided into

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[3]Department of the Air Force, Tactical Air Command, Modular Training Syllabus A7D, TAC Syllabus: Course Nos. A7000B, A7000C, A7000TXA, and A7000TXB (Langley Air Force Base, Va., October 1977), p. 31 (hereinafter cited as DAF, TAC, Course Nos. A7000B, A7000C, A7000TXA, and A7000TXB).

three courses as follows:[4]

1. Course A7000B is designed to train undergraduate pilot training graduates with T-38 fighter lead-in training to mission capable status.

2. Course A7000C is designed to train the First Assignment Air Training Command Instructor Pilots to mission capable status.

3. Course A7000TXA is designed to train the experienced TAC fighter pilot to mission capable status.

Table 2 shows the training provided in the syllabus for the three initial A-7 training courses.

Night training is begun with a night operations phase briefing that is oriented toward safety and insuring standardization of night procedures. Each mission is started with approximately 1.5 hours of pre-mission briefing that stress standardization, safety, switchology, night procedures, and the mission profile. After the completion of each mission, the debriefing covers mission accomplishment and deficient training areas. These night ground attack missions, as in the F-4 syllabus, will only be flown using ground marking devices or flares for target illumination. These missions are limited to 20° and 30° bombing patterns and high and low angle strafing using artificial illumination.[5]

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[4]DAF, TAC, Course Nos. A7000B, A7000C, A7000TXA, and A7000TXB, p. 1.

[5]DAF, TAC, Course Nos. A7000B, A7000C, A7000TXA, and A7000TXB, pp. 51 & 53.

TABLE 2.--Initial Training: A-7

Type of Instruction	Syllabus		
	A7000B	A7000C	A7000TXA
Ground Training (Hours)			
Formal academic instruction	170.5	170.5	156.5
Simulator training	24.5	18.5	16.5
Night flying academic instruction	0	0	0
Night flying phase briefing	1	1	1
Flying Training			
Total sorties	43	39	29
Total hours	79.2	75.6	53.0
Total night sorties	6	6	5
Total night hours	12	12	10
Night ground attack sorties	3	3	3
Night ground attack hours	5.7	5.7	5.7
Night flying training (percentage of total)	14%	15%	17%

DERIVED FROM: Department of the Air Force, Tactical Air Command, Modular Training Syllabus A7D, TAC Syllabus: Course Nos. A7000B, A7000C, A7000TXA, and A7000TXB (Langley Air Force Base, Va., October 1977).

In summary, the A-7 initial training syllabus provides no formal classroom instruction in the tactics and problems of the night mission. The total ground training for the night mission is found in a 1-hour phase briefing and the mission associated briefings. A total of 3 ground attack sorties are programmed with attacks limited to 20° and 30° bombing and high and low angle strafing, all using artificial illumination. This proportion of night training is insufficient to provide more than limited familiarization with the night ground attack mission. In the case of the A-7, the task of providing training to produce a night qualified attack pilot also appears to be left to the gaining operational unit.

A-10

The newest aircraft in the U.S. Air Force ground attack inventory that is designated for close air support is the A-10A. This aircraft was produced exclusively for the close air support mission. Development of the A-10 came as a result of recognized deficiencies in the close air support capabilities. In a 1971 statement before the Senate Close Air Support Subcommittee, Brig. Gen. William J. Maddox said:

> In order to effectively support the ground forces, a close air support system should be able to detect, recognize, identify, locate, and attack targets; it should also provide poststrike information to the ground commander.
>
> These capabilities are required during day and night, in adverse weather and in all types of terrain. . . . Today the target acquisition and identification by CAS [close air support] systems are seriously deficient. . . . It is questionable whether the airborne FAC of SVN [forward air controller of South Vietnam] can survive

> over the battle area in Europe. We are convinced also that substantial improvements must be made in the night and adverse weather capabilities of close air support aircraft. Priority study and development effort are required in both of these problem areas.[6]

The A-10 has since been employed in the tactical inventory. An assessment of the A-10 capability to meet the requirements General Maddox delineated has not yet been completed. Initial training of aircrews for duty in the A-10, however, has not been very different from that of the F-4 and the A-7 in terms of preparation for night combat.

The TAC syllabus for the Air Force operational training course, A-10A initial training, is provided in two courses: A1000B and A1000C. The A-10 courses differ from the F-4 and A-7 courses in that they prepare the pilot for "mission ready certification in accordance with applicable 51-series publications."[7] The "B" course is conducted to train graduates of the undergraduate pilot training basic courses who have completed the T-38 fighter lead-in course. The "C" course is provided for experienced pilots who do not qualify for the A1000TFX short course. These initial training courses provide academic and flying training as shown in Table 3.

The A-10 training sorties orient almost exclusively on the close air support task in varying threat environments. This training provides

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[6]U.S., Congress, Senate, Committee on Armed Services, Close Air Support, Hearings before the Special Close Air Support Subcommittee, 92d Cong., 1st sess., 1971, p. 93.

[7]Department of the Air Force, Tactical Air Command, Operational Training Course: A-10, TAC Syllabus: Course No. A1000B/A1000C (Langley Air Force Base, Va., June 1977), p. 1-1.

TABLE 3.--Initial Training: A-10

Type of Instruction	Syllabus A1000B	Syllabus A1000C
Ground Training (Hours)		
Formal academic instruction	128.5	128.5
Simulator training	30	30
Night flying academic instruction	0	0
Night flying phase briefing	2	2
Flying Training		
Total sorties	44	37
Total hours	92.0	78.5
Total night sorties	5	4
Total night hours	9.5	8.0
Night ground attack sorties	3	3
Night ground attack hours	6.5	6.5
Night flying training (percentage of total)	11%	11%

DERIVED FROM: Department of the Air Force, Tactical Air Command, Operational Training Course: A-10, TAC Syllabus: Course No. A1000B/A1000C (Langley Air Force Base, Va., June 1977).

a giant step forward in the training of pilots for the close air support mission. The limitation of three night ground attack training sorties, however, again prompts the question of whether there is sufficient training for the night close air support mission.

F-111

The F-111 has been a controversial aircraft in the tactical inventory. It was once thought to be only a deep interdiction weapon system for night attacks, and, because of this and other problems, it was not used to its full potential. The F-111 has more recently been viewed as a much more versatile aircraft and has been used for increasing numbers of missions, including daylight/weather conventional attack, pathfinder aircraft, and close air support missions. Now the primary missions of the F-111 are night and weather interdiction and close air support.

The F-111 conversion training course trains aircrews to mission ready status in the F-111A course, which provides training as shown in Table 4. The F-111 is proclaimed the best night attack aircraft in the U.S. Air Force tactical forces. Still, very little formal academic training in night tactical concepts and techniques is offered. Only 7 of 33 sorties are flown at night, and they concentrate on nuclear and deep interdiction tactics and bomb techniques.

Summary

A summary of the initial training offered F-4, A-7, and A-10

TABLE 4.--Initial Training: F-111

Type of Instruction	Syllabus F111AC00AI
Ground Training (Hours)	
Formal academic instruction	158
Simulator training	32
Night flying academic instruction (night terrain following radar)	1.5
Night mission planning	2
Night flying phase briefing	1
Flying Training	
Total sorties	38
Total hours	100.2
Total night sorties	7
Total night hours (including time required for air refueling)	19.2
Night ground attack sorties	7
Night ground attack hours (including time required for air refueling)	19.2
Night Flying Training (Percentage of Total)	18%

DERIVED FROM: Department of the Air Force, Tactical Air Command, Conversion Training Course: F-111A, TAC Syllabus: Course Nos. F111AC00AI, F111AC00WI, and F111AC00SI (Langley Air Force Base, Va., July 1977).

pilots shows that they receive limited or no formal academic training for the night ground attack mission (6 hours for the F-4 and no hours for the A-7 and A-10) and that each initially trained pilot may have flown only three night ground attack sorties when he reports to his operational unit. While the F-111 pilot does receive an increased number of night attack training sorties, he is still limited in his training in night close air support problems.

Admittedly, the eight syllabus courses for aircraft designated for close air support are conducted with very limited time and training funds. They also must give the pilot a broad knowledge and experience over the total spectrum of operation of his aircraft as a weapon system. The TAC fighter training is viewed as the best in the world. With the night training provided thus far, however, one could logically question pilot preparation to successfully perform a night ground attack mission in a mid-to-high intensity European conflict. The training for proficiency and professional capability in night close air support is clearly delayed until the pilot's continuation training begins in the gaining operational unit.

Continuation Training

Graduated Combat Capability

A recent innovative continuation training concept, the Graduated Combat Capability (GCC), has been agreed upon by the Tactical Air Command, Alaskan Air Command, Aerospace Defense Command, Pacific Air Forces, and United States Air Forces in Europe. The Tactical Air Command has the primary responsibility for training and has published this concept in Tactical Air Command Manual (TACM) 51-50, 12 August 1977.

TACM 51-50 establishes training standards for pilots in the A-7, A-10, A-37, F-4, F-5, F-15, F-16, F-100, F-104, F-105, F-111, RF-4, and RF-101. In regard to scope, TACM 51-50 establishes:

> a. Training programs for aircrews who are assigned to fly the unit equipped (UE) aircraft when a formal USAF [U.S. Air Force]

training course is not available.

b. Continuation training standards and programs to insure that units maintain the capability to perform their assigned tactical mission in an effective manner.[8]

The concept was developed to provide commanders with some flexibility in determining required training for pilots in unique missions and for the overall effective management of limited resources to accomplish ever more complex training tasks. TACM 51-50 describes the concept this way:

> . . . This manual outlines a flying training program referred to as the Graduated Combat Capability (GCC). The GCC recognizes that the aircrew needs to be provided the necessary sorties to train for each assigned task/mission (including specialized weapons/unique missions), and that the degree of difficulty and training complexity for each task/mission varies. Therefore, for every assigned task/mission a specified amount of flying training must be provided. It further recognizes that the Air Force is resource limited and therefore desired combat capabilities must be prioritized. It acknowledges that when a unit is resource limited, it can only be fully trained in the higher priority tasks/missions.
>
> . . . Further defined, a graduated combat capability is a prioritized statement of a unit's combat capability. The statement will be designed to meet the intended employment of the unit. Each capability will be defined by a level.[9]

Figure 2 shows an illustration of GCC levels of tasking in a prioritized format.

Pilot experience level further stratifies training. Pilots are categorized as experienced or inexperienced to assist in managing tactical flying training. An experienced pilot (1,000 hours total with

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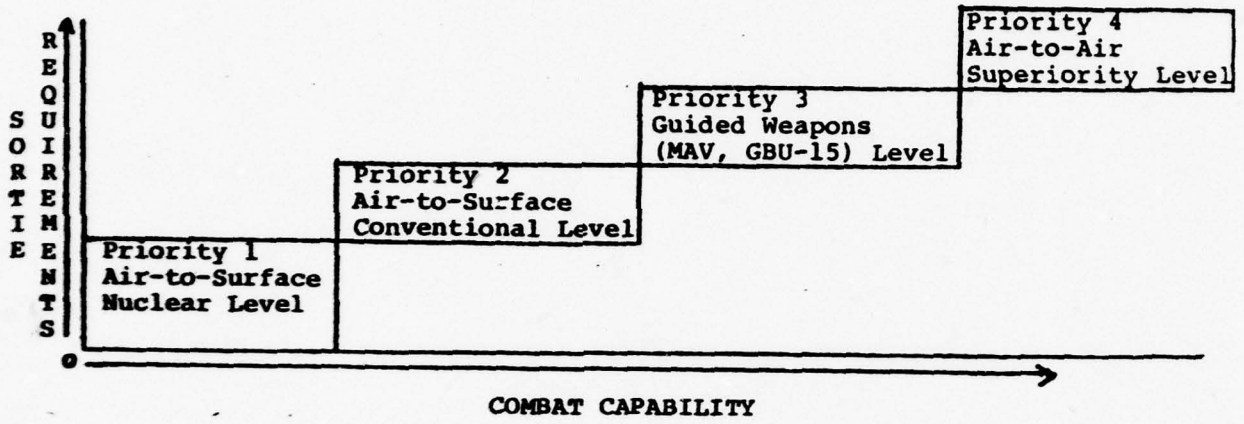
[8]Department of the Air Force, Tactical Air Command, Flying Training: Tactical Fighter/Reconnaissance Aircrew Training, Vol. I of TACM 51-50 (Langley Air Force Base, Va., 12 August 1977), p. 1-1.

[9]Ibid., pp. 1-1 & 1-2.

Illustrative Example



NOTE: A self-defense capability is included within each level.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: Tactical Fighter/Reconnaissance Aircrew Training, Vol. I of TACM 51-50 (Langley Air Force Base, Va., 12 August 1977), p. 1-2.

Fig. 2. Graduated Combat Capability Levels of Tasking

300 in tactical jets or 500 hours of tactical jet mission time) may receive less sorties than an inexperienced pilot and be considered mission ready in a particular task/mission.

Major commands manage the GCC process which determines the combat capabilities required for the total force and then assign a GCC tasking to each unit. The units then report their capability to meet their assigned tasking. This process depends upon the unit's capability to produce the needed sorties to achieve a specified level of GCC tasking. For example, if a specific GCC tasking required 5,000 sorties in a 6-month period for all pilots to be combat capable at that level and the unit records showed it capable of producing only 4,500 sorties, either the resources to produce more sorties would have to be given to the unit or the GCC tasking level would have to be lowered to match the unit's capability. In this way the major command adjusts resources or tasking to maximize the total force capability within existing resources. Units then train for their assigned GCC. Primary aircrews train to maintain a specific combat capability (GCC level) for immediate introduction into combat at that level.

After the major command assigns the unit's GCC tasking, TACM 51-50 clearly gives the unit commander the responsibility to tailor training to obtain maximum combat capability within available resources. This program has the potential to become a vast improvement over previous training concepts which required virtually the same training "squares" to be filled by each pilot regardless of proficiency and

skill. TACM 51-50 provides the guidelines below for unit commanders.

> . . . The sorties provided for CT [continuation training] in the weapon system volumes of this manual are intended as guidelines for the unit commanders. It is the responsibility of commanders at each level to develop their training programs to insure the highest degree of aircrew tactical proficiency. It is only the number of sorties required for the highest MR [mission ready] level which the unit commander must manage against. Within this constraint, he can adjust sorties in all the MR GCC levels to maximize the individual's training program. This policy places the responsibility on the unit commander to tailor an individual's training to his needs, experience and proficiency, thus achieving maximum utilization of training resources. The unit will be inspected against the GCC levels in which it is reflecting MR aircrews.[10]

Here, again, TAC acknowledges the requirement to prioritize training. Mission ready status will be achieved in the unit's primary mission (first level GCC) before attempting combat capability in higher levels of tasking.

TACM 51-50 establishes in Volume I the general training requirements for all aircrew members who fly fighter/reconnaissance aircraft for TAC. Each aircrew member must fly the minimum requirements listed in Table 5. Additional night requirements that each TAC pilot must meet include two night air refueling missions and two night formation take-offs. Regardless of GCC tasking, these minimum requirements insure that each pilot will receive at least 2 night missions, 2 night air refuelings, 2 night take-offs and landings, and 30 total sorties semiannually.

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[10]Department of the Air Force, Tactical Air Command, TAC and ARF Mission Training: Fighter and Reconnaissance, Vol. I (Chap. 6) of TACM 51-50 (Langley Air Force Base, Va., 1 October 1977), p. 6-1.

TABLE 5.--Semiannual Requirements for Aircrew Members Who Fly Fighter/Reconnaissance Aircraft

[Acronyms: WSO, Weapon System Officer; EWO, Electronic Warfare Officer; PWSO, Pilot Weapon System Officer]

Requirement	WSO/EWO	Pilot/PWSO
Penetrations	0	6
Precision approaches	0	12
Non-precision approaches	0	12
Night landings	0	2
Night sorties	2	2
Minimum sortie total: F-111	20	20
Minimum sortie total (excluding F-111)	24	30

NOTES: 1. Pilots current in more than one aircraft will accomplish at least 50 per cent of the above requirements in the unit equipped aircraft.

2. Night requirements will be determined by the major command for units located north of 60° N.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: Tactical Fighter/Reconnaissance Aircrew Training, Vol. I of TACM 51-50 (Langley Air Force Base, Va., 12 August 1977), p. 1-5.

F-4

Volume V of TACM 51-50, published 1 September 1977, is the F-4 continuation training manual. It provides training standards for maintaining qualified aircrews in mission ready status. The F-4 is a multi-role aircraft and may be assigned one or more varied missions such as nuclear strike, air-to-surface conventional attack day or night, interdiction day or night, area weapons delivery--MAVERICK, PAVE SPIKE, LORAN, and GBU-15, air superiority, air defense alert, and other more

specialized missions.[11] The fighter aircrew cannot be proficient in all of these missions. Therefore, GCC tasking for the F-4 must be prioritized and oriented toward either air-to-air or air-to-surface primary combat capabilities. Further information on the F-4 is confined to the training for the air-to-surface combat capabilities. Figure 3 displays an illustrative example of the varied sortie combinations and total sorties that could be assigned a unit.

To one inexperienced in tactical fighter training in the multirole F-4, the information presented in Figure 3 may seem confusing. The case example presented in Table 6 shows the semiannual flying requirements of an F-4 unit with GCC tasking at a level that requires nuclear combat capability plus day and night air-to-surface and interdiction combat capability. This would represent a maximum night tasking since there is no purely night GCC tasking.

This discussion of continuation training under GCC shows that an F-4 unit would have no practical night capability unless it was specifically tasked for a GCC level that required a night combat capability. Pilots of that F-4 unit would be required to fly only two night formation take-offs, two night sorties, two night air refuelings, and two night landings each six months. On the other hand, if a unit were tasked for combat capability at night, such as the case in Table 6, the

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[11] Department of the Air Force, Tactical Air Command, Flying Training: F-4 Aircrew Training, Vol. V of TACM 51-50 (Langley Air Force Base, Va., 1 September 1977), pp. 3-4 through 3-9.

A/S				
NUC A	AS B1	Day/Night AS B3	Area Wpns Del B5	Guided Wpns G
Wpns 10/8 RBS 4 EWR 2 ACBT 2 (18/16)	Wpns 12/10 AST 8/6 EWR 2 ACBT 4 (26/22) IND B2 Wpns 4 IT 9/7 EWR 2 ACBT 6 (47/41	Wpns 10/8 12/10 AST 4/4 8/6 EWR 2 2 ACBT 4 20/18 22/18 (42/36) Day/Night IND B4 D N Wpns 4 IT 6 6/4 EWR 2 2 ACBT 6 18 8/6 (68/60)	Wpns 6 SAT 4 (10)	Wpns 6 AST 8/6 EWR 2 ACBT 4 MAV G1 4 (24/22) PS G2 6 (26/24) LOR G3 4 (24/22) MAV G4 & PS 10 (30/28 MAV, PS & LOR G5 12 (32/30) GBU-15 G6 4 (24/22)

ABBREVIATIONS AND ACRONYMS

ACBT	air combat tactics
As	air support
A/S	Air-to-Surface
AST	air support tactics
Del	delivery
EWR	electronic warfare range
GBU	guided bomb unit
IND	interdiction
IT	interdiction tactics
LOR	long range navigation
MAV	Maverick
Nuc	nuclear
PS	Pave Spike
RBS	radar bomb scoring
SAT	surface attack tactics
Wpns	weapons sorties

NOTES

1. Sortie totals in parentheses depict semiannual planning requirements.
2. Each vertical column is designed to provide a complete combat capability if it were the only tasking assigned a unit.
3. To arrive at total sorties, add 6 plus 10% of total Graduated Combat Capability (GCC) sorties to the total GCC sorties.
4. Numbers after a virgule indicate reduced sorties required of experienced pilots.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: F-4 Aircrew Training, Vol. V of TACM 51-50 (Langley Air Force Base, Va., 1 September 1977), p. 3-11.

Fig. 3. Combat Capabilities: F-4

TABLE 6.--Graduated Combat Capability Tasking of A + B3 + B4

[Case: F-4 unit designated a day/night air-to-surface unit has the possible tasking of A (nuclear combat capable) + B3 (air-to-surface support, day/night) + B4 (interdiction combat capable, day/night)]

Task	No. of Required Sorties	
	Day	Night
Weapons delivery sorties	14/12	14/12
Radar bomb scoring	4	0
Air support tactics	4/4	8/6
Electronic warfare range	4	4
Air combat training	10	0
Interdiction tactics	6	6/4
Additive totals	42/40	32/26
Required GCC sorties (day + night)		74/66
Total sorties (determined by adding 6 sorties plus 10% of the GCC sorties)		13/13
Total sorties required		87/79

NOTE: Number following each virgule represents a reduced number of required sorties for experienced pilots.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: F-4 Aircrew Training, Vol. V of TACM 51-50 (Langley Air Force Base, Va., 1 September 1977), pp. 3-10 & 3-11.

inexperienced pilot would receive 32 night sorties and the experienced pilot would receive 26 night sorties each six months. Of these night sorties, 12 to 14 would be night weapons delivery training sorties. This amount of night training would far surpass the night combat training of recent years and would vastly improve the capability for night combat in Europe.

A-7

The A-7 continuation training program is comparatively simple when compared to F-4 training. The A-7 has only air-to-ground GCC taskings, although some air combat sorties are flown to gain proficiency in defensive maneuvering against an air threat. Figure 4 identifies the specific A-7 GCC levels. These levels determine the training for the air-to-surface conventional GCC for the A-7. The sorties and events listed within each level are training guidelines for the unit commander, who will adapt the training to maximize individual aircrew combat capabilities. To attain each higher combat capability, the unit must be able to support the pilot at that higher sortie rate, and the pilot must accomplish the additional required training. Only units with specific night tasking will fly those sorties in Level B3.[12]

In the A-7 continuation training program and as in the F-4 program, an A-7 unit would have no night attack training unless it was specifically tasked for a GCC level that required a night combat capability. An A-7 unit tasked for night air support Level B3 would be required to give its inexperienced pilots eight night weapons sorties each six months. Experienced pilots would fly a minimum of six night weapons sorties each six months. This night weapons training plus the required night air refueling sorties would average less than two night

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[12]Department of the Air Force, Tactical Air Command, Flying Training: A-7 Aircrew Training, Vol. III of TACM 51-50 (Langley Air Force Base, Va., 1 September 1977), p. 3-7.

B1 Air Support		B2 Interdiction		B3 Day/Night AS		B6 SAR		G1 Maverick	
					Night				
AS	8/6	IT Flt	9/7	Wpns Del	8	FAC/SCAR	2	Mav	6
BFM/ACM	2	tactics		SAT	8/6	Helicopter	2		
EWR	2	Wpns Del	2			Escort			
Wpns Del	12/10	ACT	4			Unopposed SAR	2		
		EWR	2			Opposed SAR	2		
	24/20		47/41		63/55		71/63		30/26

ABBREVIATIONS AND ACRONYMS

ACM	air combat maneuvers	IT	interdiction tactics
ACT	air combat tactics	MAV	Maverick
AS	air support	SAR	search and rescue
BFM	basic fighter maneuvers	SAT	surface attack tactics
Del	delivery	SCAR	strike control and reconnaissance
EWR	electronic warfare range	Wpns	weapons sorties
FAC	forward air control		
Flt	flight		

NOTES

1. Each vertical column is designed to provide a complete combat capability if it were the only tasking assigned a unit.
2. Numbers representing totals are additive if the tasks shown are accomplished in the following sequence: B1, G1, B2, B3, B6.
3. A pilot may progress from B2 directly to B6, without accomplishing B3, if his unit is not night tasked.
4. To arrive at total sorties, add 6 plus 10% of total Graduated Combat Capability (GCC) sorties to the total GCC sorties.
5. Where two numbers are shown, higher number reflects additional required sorties for an inexperienced aircrew.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: A-7 Aircrew Training, Vol. III of TACM 51-50 (Langley Air Force Base, Va., 1 September 1977), p. 3-7.

Fig. 4. Combat Capabilities: A-7

sorties each month. If given in concentrated night training periods, some months would pass with no night training accomplished. There is reason to doubt that an inexperienced pilot (or any pilot) can maintain proficiency and combat capability in night attack tactics with one or two sorties a month. Without the B3 level tasking, A-7 units would have no night requirements and would have little night combat capability.

A-10

The A-10 continuation training program, like that of the A-7, is simple when compared to the F-4 program. The relatively new program, published in Volume II of TACM 51-50, 10 November 1977, tasks A-10 units with only air-to-ground GCC levels. A-10 pilots also fly approximately 10 per cent of their sorties in air combat training missions that are oriented toward defensive maneuvering to negate enemy air attacks.[13]

The same GCC concepts and total sortie computations discussed for the F-4 and A-7 training apply for the A-10 continuation training. Figure 5 identifies the specific A-10 GCC levels. According to the excerpt that follows, the A-10 wing at Myrtle Beach, South Carolina, has not yet reached the capability to achieve combat readiness at the night air support level and must generate additional sorties prior to achieving the night air support level.

> The graduated combat capability matrix of the 354th Tactical Fighter Wing . . . shows that this wing, equipped with the Fairchild

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[13]"First A-10 Squadron Operational Ahead of Schedule Despite Transition Difficulties," Aviation Week & Space Technology, 6 February 1978, p. 209.

B1 Air Support		G1 Maverick	B2 Interdiction		B3 Night AS		B6 SAR	
Wpns Del	16/14	Maverick 6	IT/SAT	8/6	Night AST	6/4	FAC/SCAR	2/1
AST	16/12		ACBT	2			SAR	
EWR	4						Unopposed	2/1
ACBT	2						Opposed	2/1
	38/32	44/38		54/46		60/50		66/53

ABBREVIATIONS AND ACRONYMS

ACBT	air combat tactics
AS	air support
AST	air support tactics
Del	delivery
EWR	electronic warfare range
FAC	forward air control
IT	interdiction tactics
SAR	search and rescue
SAT	surface attack tactics
SCAR	strike control and reconnaissance
Wpns	weapons sorties

NOTES

1. To arrive at total sorties, add 6 plus 10% of total Graduated Combat Capability (GCC) sorties to the total GCC sorties.

2. A pilot may progress from B2 directly to B6, without accomplishing B3, if his unit is not night tasked.

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: A-10 Aircrew Training, Vol. II of TACM 51-50 (Langley Air Force Base, Va., 10 November 1977), p. 3-5.

Fig. 5. Combat Capabilities: A-10

> A-10, has the capability to fly 6,648 sorties every six months. It reaches the C-3 readiness level after 5,094 sorties, at which time it is fully ready in air support and has partial readiness in launching the Hughes Maverick air-to-surface missile. The C-2 level is achieved with full Maverick capability and partial capability in interdiction after 5,556 sorties. C-1 is reached after 6,054 sorties and partial readiness in search and rescue. Top level in the matrix will be reached when the wing generates 6,861 sorties in the six-month period, enabling all pilots to have achieved readiness at the night air support level.[14]

As in the F-4 and A-7, if an A-10 unit is not specifically tasked for night air support, no night air support tactics missions will be required, and the unit will not have a night support capability. If the night air support level is tasked and flown, pilots of this unit would still be required less night training than pilots of either of the other two aircraft that are designated for close air support. The inexperienced pilot would be required six night air support missions while the experienced pilot must fly only four night air support missions each six months.[15] Again, whether any pilot can maintain proficiency and attain any combat capability for the night mission with one practice sortie each month is doubtful. Units not flying the sorties required to support the night air support level of tasking, B3, would have little night combat capability.

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[14]Edward H. Kolcum, "Difficulty of Challenge Determines Credit in Grey Flag," Aviation Week & Space Technology, 6 February 1978, p. 194.

[15]Department of the Air Force, Tactical Air Command, Flying Training: A-10 Aircrew Training, Vol. II of TACM 51-50 (Langley Air Force Base, Va., 10 November 1977), p. 3-5.

F-111

Volume XII of TACM 51-50, 12 August 1977, is the F-111 continuation training manual. This volume provides training standards for maintaining qualified F-111 aircrews in mission ready status. F-111 training is designed to give simultaneous conventional and nuclear weapons capability. Specific GCC sortie levels are identified in Table 7.

The F-111 aircrews accomplish more night training than aircrews of the F-4, A-7, and A-10. Nearly one-half of the tactical training F-111 aircrews accomplish is at night. The experienced pilot in a unit tasked with A1 + A2 + A3 + B4 would receive about 14 night training missions each six months, while the inexperienced pilot would receive 16. Although a greater percentage of F-111 training is at night, overall training measured in total sorties is programmed to be approximately one-third less than for the F-4, A-7, or A-10. Therefore, low sortie production presents the limitation of training programmed at less than three night sorties per month, which, in the case of inexperienced pilots, still may be inadequate to maintain a high level of night proficiency.

F-111 beacon bombing is the basis of the night weapons delivery for close air support. Beacon bombing is a standard weapons training event and has been used in joint training exercises such as Brave Shield 17, Red Flag 78-2, and Bold Eagle "78." One disadvantage of the Beacon Bombing System is the requirement for a remote ground-based

TABLE 7.--Combat Capabilities: F-111

[GCC = Graduated Combat Capability]

GCC Tasking and Sorties	No. of Required Sorties		
	Day		Night
Nuclear (A1)			
Weapons delivery	12/8		0
Radar bomb scoring	4		0
Electronic warfare range	2		0
Total GCC sorties (A1)		18/14	
Nuclear/Conventional/Night (1) (A2)			
Weapons delivery	6/4		6/4
Radar bomb scoring	1		3
Surface attack tactics	2		2
Electronic warfare range	2		2
Additive total (A2)	11/9		13/11
Total GCC sorties (A2) (day and night)		24/20	
Advanced Nuclear/Conventional/Night (A3)			
Weapons delivery	4		1
Total GCC sorties (A2 + A3)		29/25	
Day/Night Interdiction (B4)			
Interdiction tactics	4/2		2
Dart	1		0
Air combat tactics	4		0
Additive total (B4)	9/7		2
Total GCC sorties (A2 + A3 + B4)		40/34	

SOURCE: Department of the Air Force, Tactical Air Command, Flying Training: F-111 Aircrew Training, Vol. XII of TACM 51-50 (Langley Air Force Base, Va., 12 August 1977), pp. 3-3 & 3-4.

beacon transmitter as far forward as possible and forward personnel to spot targets and give target coordinates or positions in relation to the beacon. The accuracy of the system depends on the accuracy of the forward spotter.

The excerpt that follows describes the changing roles and training for the F-111 in Europe.

> USAF's . . . [F-111 aircraft] provide at present virtually all of NATO's long-range, supersonic, low level nuclear strike capability in the European area. . . .
>
> But training emphasis among crews now is being put on all-weather close support operations aimed at rapidly destroying moving armored forces . . . .
>
> . . . . . .
>
> Prior to October, 1976, USAF F-111 units in Europe were assigned primarily to counter air static targets, such as airfields, and other rear echelon targets, such as bridges, depots and marshaling areas.
>
> In October, emphasis was changed to close air support in adverse weather conditions, and since January, training in close air support missions has been "hot and heavy."
>
> The ratio of mission assignments now expected is about 50% close air support and 50% interdiction and strike missions.
>
> To facilitate the F-111's capability in this role, transponder beacons and forward air controllers trained in their use are "coming in fast" to NATO ground forces in Europe, and a heavy training program in their use is in progress.
>
> . . . . . .
>
> The beacon bombing system, which essentially is a ground-based transponder operated by the forward air controller who then passes on the target location data to the aircraft, "enables us to do things no one else can do," according to Col. Thomas McInerney, vice commander of the 20th [F-111 wing at Upper Heyford, England].[16]

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[16]David A. Brown, "NATO's New Challenge: Air Force Doctrine,

F-111 continuation training has recently changed to emphasize night, all-weather, close air support training. With the accomplishment of the amount and types of training proposed, pilots in the F-111 will possess the best potential for success in the night/weather close air support mission in a European conflict.

Red Flag Training

In 1975 the Tactical Air Command began joint combat exercises at the Nellis Air Force Base range complex in Nevada. Pilots participate in these exercises for two weeks and face a simulated Soviet air and ground defensive threat which tries to create the type of battlefield environment that they would face during a Warsaw Pact engagement in Central Europe. Fighter squadrons are able to repeat the 2-week training cycle about once each year.

Soviet surface-to-air threats such as the SA-2, SA-3, SA-4, SA-6, and SA-9 surface-to-air missiles and the ZSU-23-4 37-mm, 57-mm, and 85-mm antiaircraft artillery are all simulated visually, and most have associated radar simulation, including vans, antenna, and electronic threat signals. Many of these systems have television cameras mounted on their optical sights which record the actions of the pilot and his aircraft and confirm kills. The pilots later view this film, learn from their own mistakes, and develop new techniques to defeat the enemy threat.

Missions Revised," Aviation Week & Space Technology, 8 August 1977, p. 48.

TAC crews are encouraged to try new employment tactics as well as established tactics. Ideas that work are evaluated and may be added to established tactics literature.

TAC crews also face a simulated Soviet air-to-air threat. Aggressor pilots in F-5 aircraft use Soviet air-to-air threat tactics to oppose the TAC forces as they are performing their attacks on the Nellis range targets.

Full-scale combat simulations often use the full spectrum of Air Force aircraft and Army, Navy, and Marine Corps participants. Recently, C-141 transports flew through the defensive threat and 700 troops from the 82d Airborne Division parachuted into a simulated ground battle. The exercises also provide an arena to test the newest United States fighter aircraft under realistic combat conditions.

Early exercises were all daylight missions to provide realistic combat training for increasing numbers of young pilots who had never seen combat and many who had never practiced with live heavy explosive ordnance. More recent exercises have emphasized night operations. In Red Flag 78-2, F-111 aircraft performed their beacon bombing mission for night close air support. Night tactics training in Red Flag exercises for other close air support aircraft, however, has been severely limited. An increased accident potential is perceived for night operation, and there is still much to be learned about day fighter tactics. Therefore, night tactical training remains a lucrative training area to be exploited at Red Flag.

Generalized Summary

The Air Force basic doctrine manual, DRAFT AFM 1-1, states that operational training must provide the skills required to accomplish the mission.

> Operational training should be conducted as realistically as possible. Its purpose is to insure that forces are ready for crisis or armed conflict under operational authority of National Command Authorities and subordinate commanders. Operational training should be tailored to existing or potential threats and to the environments where those threats must be met. Tactics, techniques, and vulnerabilities of potential enemy forces should be included in this combat mission training.[17]

The Tactical Fighter Weapons Center recognizes the problems of night close air support and the training for that mission. The Center's tactics manual says this of night close air support:

> The lack of visual references and the immediate nature of the situation produce a more demanding mission than daytime. The problems of mid-air collisions, pilot disorientation and target acquisition increase at night. It also becomes more difficult for the ground commander to ascertain both enemy and friendly positions. Since most night CAS [close air support] missions are troops in contact, it is imperative that aircrews have a thorough knowledge of night procedures and tactics.[18]

The tactics manual summarizes the night close air support chapter by stating that "extensive training involving the full spectrum of night tactics and coordination is the only way to provide accurate night

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[17]Department of the Air Force, Aerospace Doctrine: United States Air Force Basic Doctrine, AFM 1-1 (DRAFT) (20 May 1977), p. 51.

[18]Department of the Air Force, Tactical Air Command, Tactical Fighter Weapons Employment: Close Air Support Tactics (U), Vol. IV of TACM 3-1 (Langley Air Force Base, Va., April 1976), p. 9-1.

CAS."[19]

Lieutenant Colonel Charles F. Harrington, Assistant Director of Operations, 33d Tactical Fighter Wing, said:

> The proficiency level of aircrews in night combat flying depends on constant exposure to night missions. There is no secret to flying in the night combat environment. It simply takes continued practice to gain and maintain a high level of proficiency at night.[20]

All of these sources agree that the only way to insure that the tactical fighter forces have a night close air support capability is to provide extensive training and practice toward that mission. Training for tactical fighters has become more realistic, more innovative, more flexible in suiting the needs of individual pilots, and better integrated with the training of other services. The evidence thus far, however, causes doubt as to whether the extensive training required for the night close air support capability has been provided for the pilots who may be called on to fly that mission.

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[19]Department of the Air Force, Tactical Air Command, Vol. IV of TACM 3-1, p. 10-7.

[20]Charles F. Harrington, "'Nite Owl' Operations," Tactical Air Warfare Center Quarterly Report, December 1970, p. 6.

CHAPTER IV

EQUIPMENT

Extensive realistic training is essential for the pilot who would prepare himself for any mission. Training alone, however, will not insure that the pilot has the capability to perform a mission. War on today's battlefield and on the battlefield of the future will be won with the use of weapons systems that have evolved from highly advanced technology. The pilot requires the aid of advanced equipment to navigate to and from the battlefield under all conditions, to communicate with the directors of the battlefield, and to acquire the correct target 24 hours a day in good and bad weather. He must also be able to deliver accurate munitions from a position that will allow him to destroy the target, survive, and subsequently destroy other targets as often as necessary to win the war.

The availability of advanced equipment was reviewed in the areas of navigation, communication, target acquisition, and munitions. Each of these four areas was researched to explore the capabilities of currently used systems and equipment developments that may enhance the pilot's capabilities to perform his mission. The focus of the research reported in this chapter is on the capability to perform the night close air support mission.

Navigation Equipment

It is imperative that pilots have precise navigation equipment to place their aircraft in a position from which to launch an attack on reported enemy targets. Present daylight fighter tactics for the attack of targets in highly defended areas use high speed, low level navigation into the target area, where a pop-up maneuver is initiated at a precise point.[1] This maneuver places the aircraft at a sufficient altitude above the target to allow the pilot to acquire the target, "lock on" with his ordnance (if required), and deliver the munitions with accuracy and safety. Night tactics are less developed but would be even more dependent on accurate navigation equipment.

Dead reckoning, which is used as a backup navigation method on combat missions, does not rely on advanced technology.[2] It does require outside visual references or additional instrumentation to determine an accurate point of departure and to verify arrival at the correct

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[1] The pop-up maneuver is initiated from a very low altitude (between 50 and 200 feet) and high airspeed (300 to 650 nautical miles per hour, depending on normal low level speed of the aircraft). The pilot climbs his aircraft, wings level, to a pre-computed altitude that varies with the munitions to be delivered. The pilot then acquires his target visually and rolls his aircraft toward the target while meeting other munitions delivery parameters of airspeed, altitude, angle of attack, and stabilized "G" forces. If required, he locks on his electro-optical or infrared munitions and performs an escape maneuver to get his aircraft out of danger from his own weapons blast and from the air defense weapons in the target area. The complete pop-up maneuver may take as little as 6 to 15 seconds.

[2] Dead reckoning is the determination of the aircraft position by using the course flown from a known point for a specific length of time at a precise airspeed that has been corrected for known wind drift.

position. Therefore night and weather missions require extremely accurate navigation equipment.

Current technology provides very precise navigation equipment, some of which is incorporated in present Air Force systems. While systems from different manufacturers provide varying degrees of accuracy, the gyro-stabilized inertial navigation systems (INS) that are installed in the F-4, A-7, and F-111 provide adequate self-contained navigational accuracy for these tactical aircraft to carry out most of their assigned missions. The A-10 close air support aircraft, however, has not yet been equipped with an inertial navigation system. Funds earmarked to purchase a standard inertial navigation system for the A-10 were deleted from the budget for Fiscal Year 1978.[3] This program is still in "limbo." If it is reinstated, several years could elapse before the A-10 is provided with that operational capability.

Another piece of navigation equipment pilots feel is essential in night low level navigation is the radar altimeter (RA). It tells the pilot his exact location in feet above the ground. The F-4, A-7, and F-111 aircraft have this equipment, but, again, the A-10 does not.

Other navigation equipment that enhance the capability of the pilot to perform night and/or all-weather attacks are the forward-looking radar (FLR), long range navigation equipment (LORAN), terrain

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[3]"First A-10 Squadron Operational Ahead of Schedule Despite Transition Difficulties," Aviation Week & Space Technology, 6 February 1978, p. 210.

following radar (TFR), and tactical air navigation systems (TACANs). The FLR, INS, RA, and TFR are self-contained systems; LORAN and the TACANs require ground-based equipment. Navigation equipment that is standard in the four tactical aircraft which can be used to perform the close air support mission are checked (✓) in Figure 6.

	Standard In:			
Navigation Equipment	A-7	A-10	F-4	F-111
Forward-looking radar	✓		✓	✓
Inertial navigation system	✓		✓	✓
Long range navigation			*	
Radar altimeter	✓		✓	✓
Tactical air navigation	✓	✓	✓	✓
Terrain following radar	**			✓

*Standard in some F-4 models. **Possible in A-7.

Fig. 6. Navigation Equipment

The F-111 has the best proven record of accuracy for night navigation and accurate night low level weapons delivery capability. This is due to additional training in the night navigation mission and is also attributed to the accuracy of its navigation equipment. The A-7's additional aids to navigation--such as the projected map display system, the doppler radar navigation set, and the heads up display--enhance its effectiveness in the night close air support mission. As previously stated, however, the A-7 is programmed to be phased into Air National Guard units, and their pilots train only for daytime missions.

Navigation equipment in the F-4 is suitable for most of the aircraft's intended missions, but accuracy obtained using the F-4's self-contained navigation equipment limits its usage for night and weather close air support. The A-10 is not yet equipped with the necessary navigation equipment that would allow it to operate effectively in a highly defended night or weather environment.[4]

Technology using satellite equipment, an advanced inertial navigation system, distance measuring equipment, and data link is available to provide the A-7, A-10, F-4, and F-111 with navigation systems that could operate with only a very few feet of probable error. The expense of these systems make many of them economically infeasible, but some new inertial navigation systems, e.g., equipment associated with PAVE TACK, would vastly improve the accuracy of tactical navigation day or night.

Communications Equipment

To be responsive and flexible and to have the ability to communicate with friendly ground and air forces, the pilot must have good communications with the battle directors. This need for communications becomes even more critical for night operations.

The communications equipment installed in tactical fighters has been adequate for most types of missions during previous conflicts. An exception is the lack of compatible radios between strike aircraft and

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[4]"First A-10 Squadron Operational," p. 210.

ground forces for close air support missions. Both the A-7 and A-10 aircraft have VHF/FM compatibility with ground maneuver units. Neither the F-4 nor the F-111, however, has VHF/FM radios with which to make direct contact with Army maneuver units.

Since the forward air controller has UHF contact with the strike aircraft and direct contact with the ground commander, the lack of compatible radios is not considered critical in some quarters. Survival of the forward air controller in a high threat environment, however, has recently come into question. The UHF signal produces a signature that is both a very pronounced indicator of air support and a prime target for signal interception and attack. Thus, communications with forward ground units would be lost to tactical fighters that are dependent on UHF radios alone. Communications equipment in tactical aircraft are checked (✓) in Figure 7.

Communications Equipment	A-7	A-10	F-4	F-111
Airborne transponder	✓	✓	✓	✓
Identification, friend or foe/selective identification feature	✓	✓	✓	✓
Ultra high frequency/amplitude modulation	✓	✓	✓	✓
Ultra high frequency/direction finding/ auxiliary receiver	✓	✓	✓	✓
Very high frequency/amplitude modulation		✓		
Very high frequency/frequency modulation*	✓	✓		

*Equipment compatible with most U.S. Army maneuver units.

Fig. 7. Communications Equipment

Future conflicts may require extensive communications between ground units and strike aircraft. Concepts such as using a low forward air controller in a helicopter and ground troops with hand-held lasers to designate targets to be struck by Air Force close air support aircraft are now feasible and widely accepted. In 1976 the Air Force and Army task force examining forward air control operations recommended equipping some F-4s with VHF/FM radios for better communications with Army forward observers and ground maneuver units.[5] Requirements of the close air support mission, day and night, make the communication links between strike aircraft and ground forces more essential than ever for the success of the mission.

Communication and coordination of tactical forces will be improved by the new technology being incorporated in the Joint Tactical Information Distribution System (JTIDS). This system is expected to provide positive and secure identification and position of a transmitting unit. Other characteristics would be a high-capacity, secure, jam-protected digital communications primary network, a secure digitized voice communications capability, and a jam-protected navigation capability relative to other participants in the net. The Tactical Air Command will probably be the primary user of the JTIDS and will stress its air-to-ground role.[6]

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[5]"FAC/FO [Forward Air Control/Forward Observer] Interface Task Force Report" (Langley Air Force Base-Fort Monroe, Va.: Air Land Forces Application (ALFA) Agency, 1976), p. 52.

[6]Kenneth J. Stein, "Secure Communications Effort Pushed," Avia-

Acquisition Equipment

After the pilot has navigated his aircraft to the required location and accomplished the required communications with ground or air-based controllers and air defense systems, he must acquire and identify his intended target. He may accomplish this by direct visual acquisition, instrumented verification of area coordinates, or electronic acquisition. The acquisition systems presently employed include the forward-looking radar, television, and laser systems.

Forward-looking radars are standard equipment on the A-7, F-4, and F-111. The A-10 has no radar system. The accuracy of present radar acquisition systems is sufficient some distance beyond the lines of friendly forces for area targets and the bombing of static targets with distinguishable radar returns. The forward-looking radar has very limited capability with moving targets such as armor and other similar close air support targets.

The F-111 has been successful in its use of the radar in association with radar beacon bombing systems. The system relies on ground-based personnel with a forward remote beacon transmitter and can produce accuracies sufficient for day and night close air support when used in conjunction with the F-111 radar weapon delivery systems. Effectiveness, however, is dependent on the accuracy of the information the forward spotter gives. F-4 beacon bombing systems have also been

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tion Week & Space Technology, 13 February 1978, pp. 54-55.

tested, but the results were somewhat less impressive.

Television acquisition systems include the Target Identification System, Electro-Optical (TISEO), PAVE KNIFE, and cockpit television monitors. The TISEO has been in use on the F-4E since 1972. It uses a stabilized closed circuit television system that provides daylight target acquisition, identification, and tracking at ranges that far exceed the capability of the unaided eye. TISEO is used with the F-4 radar fire control system to acquire and identify airborne targets. It has little utility for ground target acquisition with high threat tactics. Cockpit television monitors are used in conjunction with electro-optical guided weapons such as the MAVERICK and electro-optical "smart" bombs.

PAVE KNIFE is a pod-mounted system that was developed for the U.S. Air Force (USAF) for fitting to the F-4. This system uses wide angle optics with a laser target illuminator and a low-light level television camera. It provides for clear night target acquisition and laser designation for attack by PAVEWAY electro-optical or laser guided bombs.[7] Although the system was successful in Vietnam, only a few pods were produced and the United States is beginning to diversify away from television guidance for precision guided munitions.[8]

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[7]"Pave Knife," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977]), p. 156.

[8]"Latest Developments in Airborne Electro-Optical Target Acquisition Systems," International Defense Review 10, No. 3 (June 1977):410.

Present operational laser systems include the PAVE SPIKE and PAVE PENNY. The PAVE SPIKE System by Westinghouse is a daylight system for a two-seat aircraft. It uses television laser ranging and laser designation facilities and is fitted primarily on F-4Ds and F-4Es. PAVE SPIKE provides a self-contained laser guided bomb delivery capability, but television effectiveness is greatly diminished at night or in reduced visibility. The PAVE PENNY system is a laser target identification set (or laser spot seeker) for the A-10. With PAVE PENNY, the pilot is able to locate and home on remotely designated targets at ranges up to 16 kilometers. He may launch laser-seeking bombs or missiles or he may use the display for a cue to aim his 30-mm GAU-8 Gatling gun.[9] PAVE PENNY will provide the A-10 with some capability for clear night operation, and it may also be used for the A-7D and F-16.

The latest technical development interest is in the Forward-Looking Infra Red (FLIR) equipment. FLIR can overcome television's inherent limitations. Television is ineffective in haze, smoke, and darkness, but a low-light level television can be used to compensate for poor light conditions. FLIR can provide round-the-clock vision even in poor weather conditions, camouflage, thin foliage, and most smoke.[10]

Improvements in electro-optical acquisition systems will greatly advance the capability for night and weather operations. One of the

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[9] "Latest Developments," pp. 411-12.

[10] "Latest Developments," p. 410.

most advanced systems in development is the PAVE TACK system.

> [I]t includes a wide field-of-view, high resolution, FLIR system plus a laser ranger/designator and is to be fitted on selected two-seat aircraft such as the F-4E and F-111F during the next five years, to provide them with improved night/adverse weather ground target acquisition and attack capabilities. It will be used with Rockwell International GBU-15 laser-guided modular glide bombs or forward fired weapons such as the 20 km range IIR [imaging infrared] Maverick. . . .
>
> . . . Ford Aeronutronic Division . . . has also been directed to develop and demonstrate a growth provision [of the PAVE TACK system] for application to the single-seat [Fairchild] A-10 aircraft. . . .[11]

Many other systems are under development and testing by other companies and other countries. The Hughes Aircraft Company advertises that development of its APG-63 Synthetic Aperture Radar has achieved the goal of detection and identification of tactical size targets in any weather, day or night. This was made possible through new digital signal-processing and coherent-frequency technology. Hughes Aircraft Company says: "Not only are smaller tactical targets visible, but also . . . [Synthetic Aperture Radar] detects mobile targets, cues forward-looking infrared and electro-optical sensors, and allows precise navigation."[12]

The USAF has an on-going group of development programs, designated PAVE STRIKE, which, though varied individually, have the common objective of upgrading the capability for conducting precision

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[11]"Latest Developments," p. 411.

[12]"Science Scope," International Defense Review 10, No. 2 (April 1977):233.

air-to-ground strikes.

> The principal items covered by . . . [these programs] are:
>
> Modular Guided Glide Bomb II [GBU-15; Modules for television, laser, IIR, and distance measuring equipment (DME)]
>
> EO [Electro-Optical] Glide Bomb (EOGB II), involving modifications to HOBO kit
>
> DME Guided SUU-54 Dispenser
>
> Precision Emitter Location and Strike System (PELSS)
>
> Deployable Data Base (facilities for putting DME co-ordinates on photographs)
>
> Airborne Locator and Strike System (ALSS)
>
> EF-111A (Manned Support Jammer Aircraft)
>
> Advanced Development of imaging IR guidance
>
> Laser Maverick
> Pave Tack Pod
> Multi-Mission RPV [Remotely Piloted Vehicle].[13]

These and other research and development programs promise to maintain the United States lead in new technology for the battlefield.

Munitions

Munitions to be used in conjunction with the new acquisition systems include improved conventional munitions and electro-optical, laser and infrared guided bombs, and missiles. Unguided conventional weapons include the general purpose high explosive bombs: MK 82 (500 pounds), MK 83 (1,000 pounds), MK 84 (2,000 pounds), and the

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[13]"Pave Strike," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977]), p. 157.

cluster bombs: MK 20 Rockeye and SUU-54B. All of these weapons can be laser-guided smart bombs with the addition of stabilizer fins and a guidance module containing a laser seeker.[14] The Rockeye contains 247 bomblets that are released to provide a pattern coverage for the destruction of tanks, vehicles, and guns. A new version contains 717 smaller bomblets for wider area, antipersonnel, and antimaterial coverage.

The SUU-54B mated with a laser guidance kit becomes the USAF PAVE STORM weapon. This 2,000-pound weapon, which contains 1,800 bomblets that are roughly the size of a grapefruit, is seen primarily as a suppression weapon for the destruction of antiaircraft artillery and missile sights and their radars.[15]

The weapons may also be fitted with an electro-optical television guidance module. A television monitor in the aircraft allows the crew to acquire the target and lock-on with the bomb's camera. The weapon can then be released and the guidance module will automatically steer the bomb to the target. These laser and television guided weapons are capable of only modified trajectories and effective stand-off ranges normally cannot be achieved.[16] Increased stand-off range was made

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[14]"Hobo (EO) and Laser-Guided Smart Bombs," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977]), p. 153.

[15]"Pave Storm," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977]), p. 157.

[16]"Hobo (EO) and Laser-Guided Smart Bombs," pp. 153-54.

possible with the "launch-and-leave" MAVERICK.

The best known of the advanced electro-optical weapons has been extensively tested and was used with good results in the 1973 Middle East War. The MAVERICK (AGM-65A) is a relatively small, television guided tactical missile designed for use against small concentrated targets such as armor, gun positions, and parked aircraft. The F-4D, F-4E, A-7D, and A-10 carry it. It has a high kill probability in daylight attack conditions. Several enhancement programs such as laser-guided and imaging infrared guided modification are underway to improve the MAVERICK's capability for night and weather attack. The MAVERICK can be fitted with the MK 19, a 250-pound warhead for better hard target and ship kill capability.[17]

Still greater stand-off range is possible when the Modular Glide Weapon System is used. The USAF refers to this development as the GBU-15(V). The base module set uses standard munitions such as the MK 84 bomb or the SUU-54 dispenser and converts the munitions to an electro-optical smart bomb as described before. Wing and tail surfaces and a guidance module are added. The four guidance modules are electro-optical, laser, imaging infrared, and distance measuring equipment. They are interchangeable so that a weapon can be provided for a day, night, or all-weather attack. The laser and imaging infrared seekers

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[17]"Maverick--Mk 19," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977], p. 152.

are the same as those being developed for the MAVERICK.[18]

Special effects weapons development include the GATOR Antitank Weapon and the Fuel Air Explosive (FAE) Weapons. The GATOR is an air-deliverable antitank and antipersonnel mine system. The mine, which is shaped to spin to aid dispersion, contains a focused charge that will penetrate the underside of a tank. The FAE Weapon creates an aerosol cloud of a fuel-air mixture that is detonated to achieve an explosive effect. The FAE is to be used against pressure-sensitive targets such as bunkers, foxholes, and minefields.[19]

F-111 forces stationed in England are shifting emphasis more to close air support attacks against armored targets but are limited by munitions.

> The capability to hit moving targets in all weather is still limited at the present time due to weaponry.
>
> The F-111s are to receive Rockeye guided bombs in the near future, but for the present [they] are restricted to free-fall iron bombs and anti-personnel cluster bomb units.[20]

These weapons also restrict the low and fast tactics that mean survivability to the F-111 force.

The USAF has initiated a high priority program to develop more effective munitions for use against armored vehicles. The testing is

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[18]"GBU-15(V)," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977], p. 153.

[19]"Fuel-Air Explosive Weapons," in Jane's Weapon Systems, ed. R. T. Pretty (New York: Franklin Watts, Inc., [1977], p. 479.

[20]David A. Brown, "NATO's New Challenge: Air Force Doctrine,

carried out at the U.S. Air Force Armament Development and Test Center, Eglin Air Force Base, Florida. "The objective is to devise one or more adverse-weather, day/night weapons with which an aircraft can disable multiple vehicles during a single pass."[21] The program consists of four projects:

> Antiarmor cluster munition, which will use what are termed "self-forging fragments." . . . The fragments would be unguided but would cover a large area and have good penetrating ability. . . .
>
> Cyclops, which would use similar self-forging fragments with the addition of a sensor, probably infrared or millimeter-wave, to detect the direction of the target and to aim the fragments before explosion. . . .
>
> Wasp, which is to be a small missile that can be launched in salvos from an aircraft or possibly from an air-dropped canister and would have the ability to acquire and lock onto an armored vehicle after launch, using an infrared or millimeter-wave sensor. . . .
>
> Extended-range antitank mine (ERAM), ...[22]

The Armament Development and Test Center plans a program to make airborne measurements of the millimeter-wave signature of typical armored vehicles to evaluate the usefulness of millimeter-wave sensors against such targets. "Original USAF plans called for the wide area antiarmor munitions program to undergo its first Air Force Systems Review Council by the Air Staff . . . [in the spring of 1978]."[23]

Missions Revised," Aviation Week & Space Technology, 8 August 1977, p. 49.

[21]"Advanced Antiarmor Weapons Pushed," Aviation Week & Space Technology, 6 February 1978, p. 161.

[22]Ibid. [23]Ibid.

Summary

If the close air support pilot is to be a viable force in the night and/or weather environment while under duress from a multitude of proven enemy air defense weapons, he must have the capability to navigate to the target, to communicate for coordination, and to acquire and neutralize the target. Each close air support aircraft has designated missions for which it is well equipped, and each has proved its worth. When delegated the night close air support mission, however, each has related equipment deficiencies. The technology required to correct these deficiencies is developed in large part. In many cases the equipment is available.

The availability of advanced munitions also limits the capability for night and all-weather attacks for close air support missions. The decision must now be made as to whether the priority of the night close air support capability will dictate the allocation of funds to produce equipment and weapon systems with the required capability.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMRNDATIONS

Summary

Historical references agree that in previous conflicts, when the Air Force has attempted to support ground forces at night, aircrew training and equipment have been inadequate or unsuitable for the night mission. Equipment advances in the Korean and South Vietnamese conflicts enabled some aircrews with specialized equipment to operate more effectively at night. It is generally conceded, however, that effectiveness increased most dramatically for units that specialized in the night mission. Even then, aircrews reporting from initial or continuation training required a period of transition and several introductory night sorties prior to becoming accustomed to the night mission and learning night tactics that had not previously been taught.

Training and equipment for the night close air support mission have been inadequate in the past. Conclusions drawn about present training and equipment for night missions follow each restated hypothesis. Recommendations and areas for further study are then presented.

Conclusions

Hypothesis 1: Individual training and unit training in night

close air support are inadequate for effective support of ground forces during night combat in a mid-to-high intensity conflict in Europe.

United States tactical air forces are presently undergoing a dynamic period of changing aircraft, tactics, and training concepts. The innovative training introduced by the Graduated Combat Capability (GCC) concepts in TACM 51-50 offers prioritized training objectives and a graduated capability that is necessary in this time of limited resources and "do-more-with-less" defense spending. Under the GCC concept, commanders have the flexibility to tailor training to each pilot's needs and to allow and encourage additional night training within the unit tasking priorities. The GCC concept, however, does not require a unit to have a night capability unless it is specifically tasked for that mission. Even then, pilots in units receiving maximum night tasking would be required only two or three night weapons training sorties each month. Trainers who have been associated with night flying believe this number of sorties is inadequate. They emphasize the difficulty of the night mission and the necessity for continuous exposure to night flying to gain and maintain proficiency.

While there are indications that Red Flag training, GCCs, and some shift in emphasis to night/weather tactics will improve the present status of night training, a review of the current training of tactical fighter aircrews indicates that night training is still the weakest training area. Tactical night training is moving rapidly away from the traditional conventional dive bomb tactics under flares, but few tactics

are offered to offset the resulting void. With the exception of the F-111 beacon bombing technique, the close air support mission at night is a rare training event. Joint Army and Air Force night close air support training exercises are also rare. Therefore, the findings of this study support the first hypothesis. There is little credible training for night close air support in U.S. Air Force tactical training.

Hypothesis 2: Equipment to give the Air Force the capability to provide effective night close air support has been developed but is not now available in the active inventory.

Technological progress in the fields of navigational accuracy, communications, acquisition equipment, and munitions has made it possible for tactical aircraft to stand off many kilometers and acquire and neutralize a laser-designated target at night. Technology and some existing equipment allow the acquisition of armored targets with forward-looking infrared equipment, through darkness, smoke, camouflage, and foliage, through selection of either laser guided or imaging infrared missiles, and by neutralization of multiple targets with launch-and-leave self-guided missiles. Some of this higher technology is manifest in present equipment and is available in small numbers. Industry can provide this technology and these weapons in quantity. Additional testing is required in many cases, however, and funding must be traced through the budget process.

While this acquisition process occurs, the A-10, the major new

close air support aircraft in the tactical forces, is flying without combat navigation aids. One Instructor Pilot in the A-10 stated: "We have no radar altimeter, no INS [inertial navigation system], and no weapon to use at night except the GAU-8, which requires a visual sighting of targets. For night attack, INS, or something better, would be essential."[1]

A limiting factor for all close air support aircraft is the availability of a munition for use against armored targets while remaining in a fast, low level profile. The U.S. Air Force Wide Area Anti-armor Munitions (WAAM) program promises to fill this void but will require further research, development, and testing time.

Some of the equipment needed to give the desired capability for night attack still requires development testing. However, many systems, such as PAVE PENNY, hand-held laser designators, advanced INS, FM radio capability, radar altimeters, and the advanced navigation and night acquisition capability of PAVE TACK, to name only a few, are available for service in the close air support aircraft. Although the Air Force and the aircraft industry have made significant strides in the development of a self-contained, night, air attack capability, the relative austerity of present close air support aircraft and, in some instances, a void of equipment necessary for night attack tend to support the second hypothesis.

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[1]Undocumented telephone conversation with an Instructor Pilot in the A-10 unit.

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USAF TRAINING FOR NIGHT CLOSE AIR SUPPORT.(U)
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Recommendations

A realistic evaluation of the night close air support requirements should be conducted. This evaluation should be directed toward the establishment of GCC tasking for the required number and types of units for that mission. Units tasked for a night close air support level GCC should then be required to accomplish concentrated periods of night tactical training on an inverted day-night schedule similar to that used by the U.S. Army Combat Developments Experimentation Command in training night qualified low level helicopter attack pilots. This training should be no less than four, concentrated, two-week periods of night tactical training during each six-month training cycle.

Red Flag training for night tasked units should be in addition to that specified in the first recommendation and should include night training in the simulated threat environment. This Red Flag training should stress integrated Army and Air Force operations. The forward air controller, forward observer, and fighter integrated tactics and concepts for night operations should also be exercised.

The A-10 INS Program should be reinstated and given priority to insure that the first A-10s to Europe arrive with operational INS, PAVE PENNY pods, and the laser seeker MAVERICK. The A-10 forward-looking infrared systems (PAVE TACK) and the 20-km imaging infrared MAVERICK must be deployed in the A-10 as soon as possible to insure around-the-clock close air support deterrent force.

All strike aircraft with a close air support tasking should be

equipped with communications that are compatible with ground maneuver units, i.e., VHF/FM radios in the F-111, F-4, and F-16 aircraft.

The production of conventional guided munitions with multiple target kill capability, such as the Cyclops and Wasp, should be pursued for the earliest possible employment into the North Atlantic Treaty Organization countries opposing the Warsaw Pact countries.

The greatest advantage the tactical aircraft offers against a conventional armored attack lies in its flexibility, lethality, and capability for independent action. This advantage is greatly diminished when the aircraft is operating under a control system that is dependent on highly vulnerable communication links with forward air controllers and forward observers whose survivability is in question. The U.S. Army Active Defense Concept in FM 100-5 deploys large forces, perhaps one-third of total strength, into a covering force area to fight a major battle. This area may encompass terrain 30 or more kilometers deep. In FM 100-5, massive close air support is deemed critical to support these forces against a breakthrough attack. This massive air support will be restricted by fire support coordination lines, target marking and identification, and clearance required prior to attack. Further, accomplishment of close air support will be complicated by severed or jammed communications, enemy air defense systems, and expected wartime confusion. These restrictions and complications may cause the close air support control system, as it is currently known, to fail. Should this occur, Air Force capability to discriminate between targets in an area

containing an ill-defined mixture of friendly and enemy forces will be seriously degraded. This problem will be most critical at night. Given the failure of the close air support system as suggested, serious doctrinal and tactical questions arise. A study of alternative actions in the event of failure of the close air support system should be made.

Finally, this study should be continued and expanded into a classified study to establish the actual status of the night capability of pilots who would be required to fight the first night close air support battle in Europe. The expanded study should include GCC tasking, available equipment capabilities, actual training performed, and individual pilot perception of capability and shortfalls with respect to the night close air support mission in a mid-intensity European conflict. The vehicle for such a study could be the pilot survey shown in the appendix.

APPENDIX

PILOT EXPERIENCE AND TRAINING SURVEY

Please use the answer sheet and a No. 2 lead pencil for recording your answers.

Do not enter your name or SSN on the answer sheet.

1. My present major command is: (A) TAC (B) USAFE (C) PACAF

2. My present aircraft is: (A) F-4 (B) A-10 (C) A-7 (D) F-111

3. My total flying time is:

   (A) 0-300 hr
   (B) 300-500 hr
   (C) 500-750 hr
   (D) 750-1,000 hr
   (E) more than 1,000 hr

4. My total flying time in tactical jet fighters is:

   (A) 0-300 hr
   (B) 300-500 hr
   (C) 500-750 hr
   (D) 750-1,000 hr
   (E) more than 1,000 hr

5. My total years of operational experience in TAC is:

   (A) 0 yr (B) 1 yr (C) 2 yr (D) 3 yr (E) 4 or more yr

6. My total years of operational experience in USAFE is:

   (A) 0 yr (B) 1 yr (C) 2 yr (D) 3 yr (E) 4 or more yr

7. My total years of operational experience in PACAF is:

   (A) 0 yr (B) 1 yr (C) 2 yr (D) 3 yr (E) 4 or more yr

8. My total number of years of flying in units with close air support (CAS) as a primary or secondary mission is:

   (A) 0 yr (B) 1-3 yr (C) 3-5 yr (D) 5-7 yr (E) 7 or more yr

9. I have flown CAS missions in combat. (A) Yes (B) No

10. I have flown <u>night</u> CAS missions in combat. (A) Yes (B) No

11. I am presently reported as combat ready. (A) Yes (B) No

In answering Items 12-18, it is important to visualize your mission as CAS in close proximity to friendly forces in a combat environment of mid-to-high intensity conventional conflict in Europe. The Warsaw Pact forces are attacking under their air defense umbrella, and both NATO and the Warsaw Pact are using the full range of general purpose weapons short of nuclear conflict.

12. How do you rate your training and preparation to successfully perform a CAS mission during mid-to-high intensity combat in Europe?

    (A) Excellent training and preparation for effective support of ground forces.

    (B) Adequate training and preparation for effective support of ground forces.

    (C) Adequate for effective support of ground forces if additional "top off" sorties are possible.

    (D) Inadequate training and preparation for effective support of ground forces.

    (E) Severely lacking in training and preparation for effective support of ground forces.

13. How do you rate your training and preparation to successfully perform a night CAS mission during mid-to-high intensity night combat in Europe?

    (A) Excellent training and preparation for effective support of ground forces at night.

    (B) Adequate for effective support of ground forces at night; no additional training needed.

    (C) Adequate for effective support of ground forces at night with additional "top off" sorties.

    (D) Inadequate for effective support of ground forces at night.

    (E) Severely lacking in training and preparation for effective support of ground forces at night.

14. In your opinion, what percentage of your squadron is adequately trained to fly combat CAS missions in the described environment?

    (A) 0% (B) 0%-20% (C) 20%-40% (D) 40%-60% (E) 60% or more

15. In your opinion, what percentage of your squadron is adequately trained to fly night combat CAS missions in the described environment?

    (A) 0% (B) 0%-20% (C) 20%-40% (D) 40%-60% (E) 60% or more

16. If you believe you are not adequately trained for night combat CAS missions in the described environment, how many additional "top off" sorties do you think you need before flying night combat CAS?

    (A) 1-2
    (B) 3-4
    (C) 5-6
    (D) 7-8
    (E) "Top off" training would not solve the problem.

17. How do you rate your present aircraft equipment in giving you the capability to successfully perform a CAS mission during mid-to-high intensity combat in Europe?

    (A) Excellent equipment for accomplishing the mission.

    (B) Good equipment for mission accomplishment, with some limitations that the pilot can overcome.

    (C) Fair equipment for the mission. Definite limitations that will detract, but the mission can be accomplished.

    (D) Poor equipment for the mission. Certain equipment limitations will cause the mission to fail more often than succeed.

    (E) The mission success or failure does not depend on the aircraft equipment.

18. How do you rate your present aircraft equipment in giving you the capability to successfully perform a night CAS mission during mid-to-high intensity combat in Europe?

    (A) Excellent equipment for accomplishing the night CAS mission.

    (B) Good equipment for the night CAS mission, with some limitations that the pilot can overcome.

    (C) Fair equipment for the night CAS mission. Definite limita-

tions will detract, but the mission can be accomplished.

(D) Poor equipment for the night CAS mission. Certain equipment limitations will cause the mission to fail more often than succeed.

(E) The night CAS mission success or failure does not depend on the aircraft equipment.

Items 19-35 relate to the number and type of training sorties you have flown in the past 6 months and the past 30 days. If necessary, please refer to your training records and mark the answers as accurately as possible.

19. My total number of sorties during the last 6 months was:

(A) less than 30
(B) 30-44
(C) 45-59
(D) 60-74
(E) 75 or more

20. My total number of sorties during the last 30 days was:

(A) 0-4 (B) 5-9 (C) 10-14 (D) 15-20 (E) more than 20

21. My total number of night sorties during the last 6 months was:

(A) 0-3 (B) 4-5 (C) 6-9 (D) 10-15 (E) 16 or more

22. My total number of night sorties during the last 30 days was:

(A) 0 (B) 1-3 (C) 4-5 (D) 6-9 (E) more than 9

23. My total number of ground attack sorties during the last 6 months was:

(A) 0-15 (B) 16-25 (C) 26-35 (D) 36-45 (E) more than 45

24. My total number of ground attack sorties during the last 30 days was:

(A) 0-5 (B) 6-7 (C) 8-10 (D) 11-13 (E) 14 or more

25. My total number of night ground attack sorties during the last 6 months was:

(A) 0-3 (B) 4-6 (C) 7-10 (D) 11-15 (E) more than 15

26. My total number of night ground attack sorties during the past 30 days was:

(A) 0 (B) 1-3 (C) 4-5 (D) 6-9 (E) 10 or more

27. My total number of CAS training sorties during the past 6 months was:

(A) 0-3 (B) 3-5 (C) 5-10 (D) 10-15 (E) more than 15

28. My total number of CAS training sorties during the past 30 days was:

(A) 0 (B) 1-2 (C) 3-4 (D) 5-6 (E) 7 or more

29. My total number of night CAS training sorties during the past 6 months was:

(A) 0 (B) 1-5 (C) 5-10 (D) 10-15 (E) more than 15

30. My total number of night CAS training sorties during the past 30 days was:

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4 or more

31. My total number of CAS joint training sorties with Army units during the past 6 months was:

(A) 0 (B) 1-3 (C) 4-5 (D) 6-9 (E) 10 or more

32. My total number of CAS joint training sorties with Army units during the past 30 days was:

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4 or more

33. My total number of night CAS joint training sorties with Army units during the past 6 months was:

(A) 0 (B) 1-3 (C) 4-5 (D) 6-9 (E) 10 or more

34. My total number of night CAS joint training sorties with Army units during the past 30 days was:

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4 or more

35. My squadron is presently training under:

(A) AFM 51-34 (B) AFM 51-50 (C) Other

This completes the survey. Please insure that all of the answers are marked on the answer sheet.

Mail the completed answer sheet in the envelope furnished for your convenience.

Thank you for your time and cooperation.

If you wish further information about the results of this survey or findings of the study, include your request and name and address with the return of the survey.

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